ATTO Technology Inc.

ATTO FibreBridge™ 4500C/R/D

Installation and Operation Manual

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Contents

1 Fibre Channel is a key technology for storage 1

Glossary

2 ATTO FibreBridge supports diverse SAN needs 3

2.1 ATTO FibreBridge 4500C characteristics 5

Dimensions
Environmental requirements
Power
Reset button
Integration parameters
cPCI Configuration
Fibre Channel ports
SCSI ports
Ethernet port
Serial port
LED indicators
Installing the FibreBridge 4500C

2.2 ATTO FibreBridge 4500R/D characteristics 7

Dimensions
Cooling and airflow
Power
Fibre Channel ports
SCSI ports
Ethernet port
Serial port
Reset button
LED indicators
Mounting on a rack

2.3 Connecting SCSI devices to SCSI ports 9

2.4 Connecting the Fibre Channel ports 10

3 Configuring the FibreBridge 11

Command Line Interface (CLI)
Menu mode
ATTO BridgeTools

3.1 ATTO FibreBridge addressing 13

Fibre Channel World Wide Name (WWN)
Arbitrated Loop Port Address (AL_PA)
Addressing devices

3.1.1 Mapping devices 14

AutoMap
AddressMap A
AddressMap B
AddressMap C
RouteXXX family

3.2 Handling multiple initiators 17
Single initiator
Multiple Fibre Channel initiators
Multiple FC & SCSI initiators

4 Accessing ATTO FibreBridge Services 19
Access the ATTO FibreBridge through in-band SCSI over Fibre Channel
Access the ATTO FibreBridge over the RS-232 port
Configure the ATTO FibreBridge for a network over the Ethernet port
Access the ATTO FibreBridge using Telnet or FTP over Ethernet

4.1 Command line use and guidance 21

4.1.1 General use commands 22
Help
Menu
RestoreConfiguration
SaveConfiguration
SerialNumber
VerboseMode

4.1.2 Diagnostic commands 23
ClearEvent
DispEvent
DispFcPortDB
DisplayEvent
EccLog
ErrorLog
FcPortList
FcSCSIBusyStatus
FcTargets
FcWWName
FibreBridgeModel
FibreBridgeName
Help
IdentifyFibreBridge
Info
LogEvent
OEMConfigFile
ParityLog
Performance
POSTOutput
ScsiPortList
ScsiTargets
Temperature
XCDevices
XCError
XCStatus

4.1.3 Maintenance commands 27
FirmwareRestart
FixedLengthReqSense
IsReserved
MaxEnclTempAlrm
MinEnclTempAlrm
Reserve

RestoreConfiguration
ScsiPortReset
SpeedWrite
SpeedWriteDefault
Zmodem

4.1.4 SCSI configuration commands 29

ScsiInitID
ScsiPortBusSpeed
ScsiPortList
ScsiPortReset
ScsiPortResetOnStartup
ScsiPortSelTimeout
ScsiPortSyncTransfer
ScsiPortTaggedQueuing
ScsiPortWideTransfer
ScsiTargets
ScsiTermination
SpeedWrite
SpeedWriteDefault
VirtualDriveResponse

4.1.5 Fibre Channel configuration commands 31

BootFibreDelay
BootScan
BootScanPorts
DispFcPortDB
FcAck0
FcClass2
FcConnMode
FcFairArbFcFullDuplex
FcHard
FcHardAddress
FcInitiator
FcPortFailure
FcPortList
FcSCSIBusyStatus
FcTargets
FcWWName
FibreBridgeTargetLUN
Performance
ServicesLUN

4.1.6 Serial Port configuration commands 34

SerialPortBaudRate
SerialPortEcho
SerialPortHandshake
SerialPortStopBits

4.1.7 Ethernet configuration commands 35

DhcpFixedDelay
EthernetSpeed
Exit
IPAddress
IPDHCP
IPGateway
IPSubnetMask

4.1.8 Mapping commands 36
AddressMap
AutoMap
BootFibreDelay
BootScan
BootScanPorts
DispFcPortDB
FcConnMode
FcHard
FcHardAddress
FcPortFailure
FcTargets
FibreBridgeTargetLUN
RouteChange
RouteDisplay
RouteOffline
RouteOnline
ScsiTargets
ServicesLUN

4.2 FibreBridge menu text-based CLI interface 39

4.3 ATTO BridgeTools provides graphical interface 40

4.4 In-band CLI uses SCSI over Fibre port 41

5 Enhancing performance 43

6 Updating firmware 44

7 Serverless backup support 45

Index: Command Line Interface i

Appendix A: Board layouts iii

Appendix B: Examples of command usage v
RouteXxxxx commands
AutoMap Command Sequences

Appendix C: Standards and compliances ix

Appendix D: Fibre Channel accessories x

Appendix E: Contact ATTO Technology, Inc. xii

1 Fibre Channel is a key technology for storage

Fibre Channel is a serial communications technology designed to transfer large amounts of data between a variety of hardware systems over long distances. It is a key technology for applications that require shared, high bandwidth access to storage.

Fibre Channel provides a logical point-to-point serial channel for the transfer of data between a buffer at a source device and a buffer at a destination device. It moves buffer contents from one port to another, without regard to the format or meaning of the data, so different upper level protocols are able to run over Fibre Channel hardware.

The Fibre Channel architecture is structured as a hierarchical set of protocol layers. Defined within these layers are rules for signal interfaces, serial encoding and decoding, error control, frame format and communications protocols.

All ATTO FibreBridge™ models can be used in a SAN (Storage Area Network) to connect a variety of Fibre Channel and SCSI devices to meet your needs.

A SAN is a shared storage architecture connecting computers and storage devices for online data access. Each connected system can directly access any attached storage device. Storage devices could include RAID, tape backup, tape library, CD-ROM library, standalone disk drives or JBOD.

SANs maintain greater fault tolerance and load balancing by supporting server clustering and failover (the ability for one server to take over for another in the event of a failure).

ATTO FibreBridge models provide the interface between SCSI and Fibre Channel resources in SANs. Possible configurations depend upon your current hardware and what you need to do.

Glossary

Some terms used in the Fibre Channel industry are defined below. More information is available through the Fibre Channel Industry Association (www.fibrechannel.com)*, the Storage Area Networking Industry Association* (www.snia.org) *and the Fibre Channel Consortium* (www.iol.unh.edu).

Term	Definition
fabric	A Fibre Channel switch or two or more Fibre Channel switches interconnected to physically transmit data between any two N_Ports on a switch or switches.
failover	The substitution of a working system for one which has failed.
FC-AL	Fibre Channel Arbitrated Loop: A Fibre Channel network in which up to 126 systems and devices are connected in a loop topology, with each transmitter connecting to the receiver of the device to its logical right. The Fibre Channel Arbitrated Loop protocol used for transmission is different from Fibre Channel switched and point to point protocols. Multiple FC-AL loops can be connected via a fabric switch to extend the network.
firmware	Software stored in read-only memory (ROM) or programmable ROM (PROM). Firmware is often responsible for the behavior of a system when it is first switched on.

Term	Definition
F_port	A port in the Fibre Channel fabric where a N_port may attach
FL-port	A port in the Fibre Channel fabric where a NL_port may attach in an arbitrated loop
hot swapping	Components are removed and replaced while the unit is running, with power to either the component or a device connected to the unit. Not all components are hot swappable: please read installation and maintenance instructions carefully.
initiator device	A component which originates a command
JBOD	Just a Bunch Of Disks: a storage subsystem using multiple independent disk drives with or without RAID configuration.
LED	Light-emitting diode, a type of diode that emits light when current passes through it. Visible LEDs are used as indicator lights on all sorts of electronic devices.
LUN	Logical Unit Number: a SCSI or Fibre Channel identifier of a device
NL port	A port attached to a node in Fibre Channel arbitrated loop or fabric loop configurations
N_port	A port attached to a node used with point to point or fabric configurations
RAID	Originally Redundant Array of Inexpensive Disks, now Redundant Array of Independent Drives: a storage system spanning multiple disk drives.
SCSI	Small Computer Systems Interface: a processor-independent standard for system-level interface between a computer and intelligent devices including hard disks, floppy disks, CD-ROM, printers, scanners, etc.
topology	Logical layout of the parts of a computer system or network and their interconnections

2 ATTO FibreBridge supports diverse SAN needs

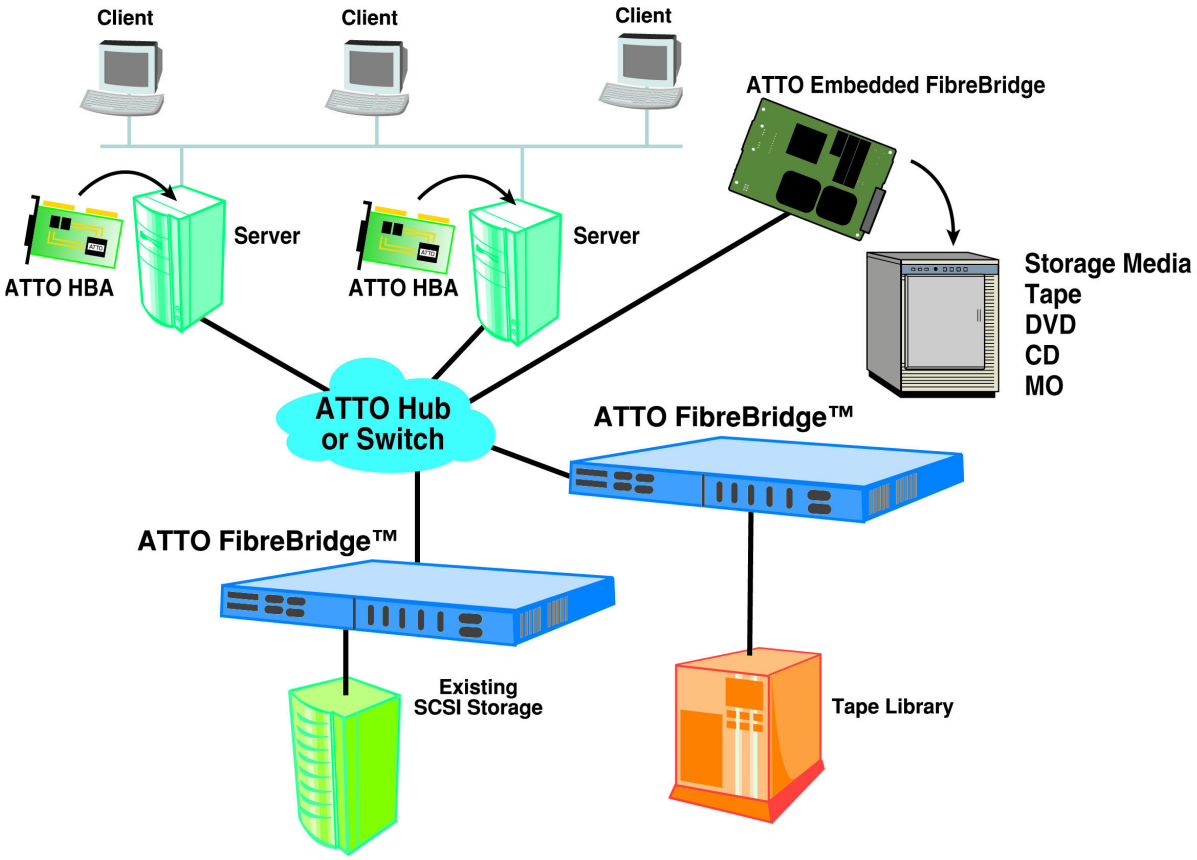
The ATTO FibreBridge family of products provides a Fibre Channel-to-SCSI bridge available as a Compact PCI board, a stand alone enclosure that can be fitted for rackmount integration, or a desktop unit, depending on the model and your needs.

The ATTO FibreBridge family of products share common configuration options and functions to provide the most versatile connectivity options available.

Each product has been engineered to address specific customer needs. New capabilities are integrated into products throughout the FibreBridge family as much as possible, requiring only an upgrade of firmware to incorporate them into your SAN (see Chapter 6). To make sure you have the most up-to-date version of the firmware, visit the ATTO Technology website, www.attotech.com.

All ATTO FibreBridge models include full duplex mode, Class 2, Class 3 and direct fabric connect capabilities.

Please refer to the Technical Specifications available at www.attotech.com for more complete information.



ATTO FibreBridge and iPBridge availability matrix

	FibreBridge 1180	FibreBridge 1290	FibreBridge 2300	FibreBridge 2350	FibreBridge 3300	FibreBridge 4500	iPBridge 2500
Configuration	Board Desktop	Board	Board Rackmount Desktop	Board	Rack mount	Board Rackmount Desktop	Board Rackmount Desktop
Fibre Channel ports	1	1	1	1	1	3	0
FC port number	0	0	0	0	0	0, 1, 2	
FC interface	DB9/SC	SFP	SFP	SFP	SFP	SC	
Data transfer rate per sec.	1 Gigabit	2 Gigabit	2 Gigabit	2 Gigabit	2 Gigabit	1 Gigabit	1 Gigabit
SCSI ports	1	2	2	2	2	4	2
SCSI bus number	0	0, 1	0, 1	0, 1	0, 1	0, 1, 2, 3	0, 1
SCSI negotiation max capability	Ultra2	Ultra3	Ultra3	Ultra3	Ultra3	Ultra2	Ultra3
Ethernet management port (MP)	0	1 10/100	1 10/100	1 10/100	1 10/100	1 10/100	1 10/100/1000
iSCSI or NDMP protocol							√
Ethernet data port (DP)	0	0	0	0	0	0	2 10/100/1000
Serial management port	1	1	1	1	1	1	1
In-band FC management	√	√	√	√	√	√	
Menu interface	√	√	√		√	√	
BridgeTools management	√	√	√		√	√	
In-band CLI	√	√	√	√	√	√	
Error checking & correction memory	√	√	√	√	√	√	√
Serverless backup	√	√	√	√	√	√	
ATTO ExpressNAV browser-based management				√			√
Advanced diagnostics				√			√

2.1 ATTO FibreBridge 4500C characteristics

The ATTO FibreBridge 4500C is a Fibre Channel to SCSI bridge with a CPCI interface for high throughput enterprise environments designed for mission-critical applications.

The FibreBridge 4500C is a single embedded PCB with CPCI interface.

Dimensions

Width: 6.5 inches (170 mm)

Length: 9.25 inches (230 mm)

Height: .75 inches (19 mm).

Environmental requirements

Operating Temperature: 5-70^{O} C

Humidity: 0-90% non-condensing

Ambient air should not exceed 50^{O}C.

Airflow Recommended 200 LFM air flow

Power

The FibreBridge 4500C draws power from a standard CPCI connector.

Current draws	12V	5V	3.3V
LVD: 22.1 Watts	8.0A	2.29A	3.2A
HVD: 28.6 Watts	8.0A	3.71A	3.0A

Reset button

The reset button near the LED indicators on the connector side of the FibreBridge will restart the FibreBridge without having to power cycle the drive enclosure.

Integration parameters

- ➔ On board processor: Intel i960JT Microprocessor
- ➔ Flash: 2x16Mbit to store Xilinx configuration and i960, 2200 and 896/1010 firmware
- ➔ Internal 66MHx PCI bus
- ➔ 512 KB SDRAM
- ➔ FC ASIC: Qlogic ISP2200A
- ➔ HVD SCSI ASIC: LSI Logic SYM53C896
- ➔ LVD SCSI ASIC: LSI Logic SYM53C1010

cPCI Configuration

- ➔ 6 U PCB with dual (31, 32) interfaces per PICMG 2.0 R3.0
- ➔ 31 connector - Type A 7x25 (154 pin plus 21 keying pins) for power, ground and power OK LEDs
- ➔ 32 connector - Type B 7x22 (154 pin plus 0 keying pins) for power, ground and I^2bus
- ➔ I^2bus consists of data line and clock signal
- ➔ Hot swap capabilities per PICMG 2.1 R2.0

Fibre Channel ports

Each of the three fixed Fibre Channel ports can connect the FibreBridge to either a Fabric or Arbitrated Loop.

- ➔ 1.0625 gigahertz (200 MB/sec.in full duplex mode)
- ➔ Class 2, Class 3 and ANSI Fibre Channel specifications support
- ➔ PLDA, Public Loop Login (NL_port) and Fabric Direct Connect (N_port) support
- ➔ Full Duplex transmission support
- ➔ Three independent SC optical connectors

SCSI ports

The four VHDCI SCSI ports on the FibreBridge 4500C connect storage devices into the Fibre Channel Storage Area Network (SAN). Each port is totally independent from the others.

A FibreBridge 4500C can be ordered with either of the following SCSI ports:

Ultra 2 (LVD) SCSI 80 MB/sec. max per bus, downward compatible with all forms of single-ended SCSI

High Voltage Differential (HVD) Ultra SCSI 40 MB/sec. max per bus

Ethernet port

The 10/100 Base T Ethernet port supports FTP, SNMP- and Telnet-based monitoring and management through a command line interface, menu system or graphical interface (ATTO BridgeTools).

Serial port

The 10-pin serial port connector provides support for remote monitoring and management through a command line interface, menu system or graphical interface (ATTO BridgeTools).

In order to use the RS-232 port, you must ensure there is enough clearance above the face plate for the ribbon cable: do not place another card in the adjacent slot of the CPCI rack. Connect the 10 pin to DB9 converter cable to header P3 (in the same corner of the board as the RJ45 connector)

LED indicators

Fault

FC 0 Activity, FC 1 Activity, FC 2 Activity: each LED blinks to show activity on the Fibre Channel port (numbered 0, 1 and 2). During very high activity, the LEDs appear to be steadily lit.

SCSI 0 Activity, SCSI 1 Activity, SCSI 2 Activity, SCSI 3 Activity: each SCSI bus has its own LED to show activity on that bus (numbered 0, 1, 2, 3).

Ready: should light after the FibreBridge has passed its internal self diagnostic test, indicating the FibreBridge is ready to operate. Fault: indicates if there is a problem with the FibreBridge. If the fault LED blinks in a consistent pattern, contact ATTO Technology Technical Support.

Installing the FibreBridge 4500C

The ATTO FibreBridge 4500C offers a variety of ways to connect into a SAN.

1. **Mount the FibreBridge 4500C into a standard CPCI rack mount system or, for custom placement, use the mounting holes.**
2. **Connect the SCSI devices to the FibreBridge. (See Chapter 2.3)**
3. **Connect the FibreBridge to your SAN: attach short wave optical cables into the Fibre Channel ports on the FibreBridge. (See Chapter 2.4)**
4. **Connect to the management (services) port via the RS-232 serial port, Ethernet, or in-band SCSI over Fibre Channel. (See Chapter 4)**
5. **Use ATTO BridgeTools™, a graphical interface utility enclosed with your FibreBridge, or Command Line Interface to map your devices to the appropriate FibreBridge Fibre Channel ports (See Chapter 3.1 and Chapter 4.1.8)**
6. **Boot the computers on the SAN and set up the configuration for the devices connected to the FibreBridge.**

2.2 ATTO FibreBridge 4500R/D characteristics

The ATTO FibreBridge4500R/D is a Fibre Channel to SCSI bridge for high throughput enterprise environments designed for mission-critical applications which can be used on a desktop or in a rack.

The FibreBridge 4500R/D is a versatile enclosure with attached feet for horizontal desktop use and mounting brackets to convert to standard 19-inch enclosures. All cable connections and the power switch are on one outer panel (which may be considered the front or the back of the bridge depending on your needs) while LED indicators are on both outer panels.

Dimensions

Width: 16.725 inches (424.5 mm.)

Depth: 10 inches (253.8 mm)

Height: 1.72 inches (43.7 mm).

Weight: 10 pounds

Cooling and airflow

Temperature: 5-50^{o} C

Humidity: 0-90% non-condensing

Ambient air should not exceed 50^{o}C.

Air enters from the front and is exhausted out the connector side by a blower inside the enclosure which provides 11 cubic feet per minute of airflow.

WARNING Do not block the enclosure's vents. The FibreBridge will shut down if overheating occurs.

Power

The power supply circuit is permanently mounted within the enclosure and is not hot swappable. It has one standard IEC320 power receptacle and switch.

The universal power supply provides power for the bridge board and cooling fans.

Input voltage 110/230V AC, with operating input range of 90-132V AC or 175-264V AC, 47-63Hz, single phase. The AC input range selection is automatic with no manual or jumper switchover required.

Output voltage +12V at 0.4 amps, +5 at 3.0 amps, +3.3V at 7 amps.

Power draw 2 amps at 110V.

Fibre Channel ports

Each Fibre Channel port can connect the FibreBridge to either a Fabric or Arbitrated Loop.

- ➔ 1.0625 gigahertz (100 MB/sec.)
- ➔ Class 2, Class 3 and ANSI Fibre Channel specifications support
- ➔ PLDA, Public Loop Login (NL_port) and Fabric Direct Connect (N_port) support
- ➔ Full Duplex transmission support
- ➔ Fixed optical short wave connectors

SCSI ports

The four SCSI ports on the FibreBridge 4500 connect storage devices into the Fibre Channel Storage Area Network (SAN). Each port is totally independent.

A FibreBridge can be ordered with either of the following SCSI ports:

Ultra 2 (LVD) SCSI 80 MB/sec. max per bus, downward compatible with all forms of single-ended SCSI

High Voltage Differential (HVD) Ultra SCSI 40 MB/sec. max per bus

Ethernet port

The 10/100 Base T Ethernet port supports FTP-, SNMP- and Telnet-based monitoring and management.

Serial port

The RS-232 serial port provides support for remote monitoring and management.

Reset button

The reset button near the LED indicators on the connector side of the FibreBridge will restart the FibreBridge.

LED indicators

FC 0 Activity, FC 1 Activity, FC 2 Activity each LED blinks to show activity on the Fibre Channel port (numbered 0, 1 and 2). During very high activity, the LEDs appear to be steadily lit.

SCSI 0 Activity, SCSI 1 Activity, SCSI 2 Activity, SCSI 3 Activity each SCSI bus has its own LED to show activity on that bus (numbered 0, 1, 2, 3).

Ready should light after the FibreBridge has passed its internal self diagnostic test, indicating the FibreBridge is ready to operate.

Fault indicates if there is a problem with the FibreBridge. If the fault LED blinks in a consistent pattern, contact ATTO Technology Technical Support.

Installing the FibreBridge 4500C/R/D

1 **Physically place the FibreBridge 4500 where you want it, horizontally on a desktop or into a rack.**

2 **Connect the SCSI devices to the FibreBridge. (See Chapter 2.3)**

3 **Connect the FibreBridge to your SAN: attach short wave optical cables into the Fibre Channel ports on the FibreBridge. (See Chapter 2.4)**

4 **Connect to the management (services) port via the RS-232 serial port, Ethernet, or in-band SCSI over Fibre Channel. (See Chapter 4)**

5 **Use ATTO BridgeTools™, a graphical interface utility enclosed with your FibreBridge, or the Command Line Interface, map your devices to the appropriate Fibre Channel ports. (See Chapter 3.1 and Chapter 4.1.8)**

6 **Boot the computers on the SAN and set up the configuration for the devices connected to the FibreBridge.**

Mounting on a rack

➔ You may install "L" brackets so that either the front or the connector side of the FibreBridge 4500 can be facing front. The mounting holes on the "L"-bracket fit a standard 19-inch rack using a centered 1.25-inch (31.7 mm) hole pattern.

➔ The ATTO FibreBridge 4500R weighs about 10 pounds. Be careful when installing it a rack.

➔ Always stack the rack from the bottom up to ensure a stable and safe rack.

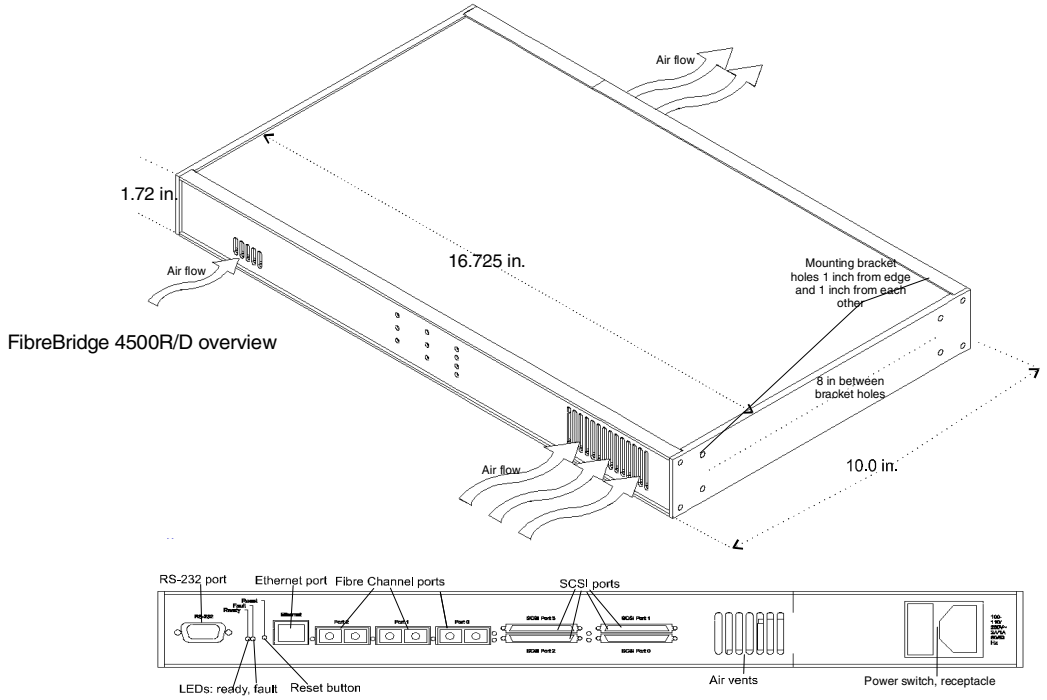
➔ Minimum rack depth: 10 inches.

➔ Make sure the power requirements of the ATTO FibreBridge 4500R plus the cumulative power draw of the other equipment in the rack do not overload the supply circuit and/or wiring of the rack.

➔ Properly ground the FibreBridge 4500R to the rack equipment. The earth ground connection must be maintained when supply connection is other than direct connection to the branch circuit.

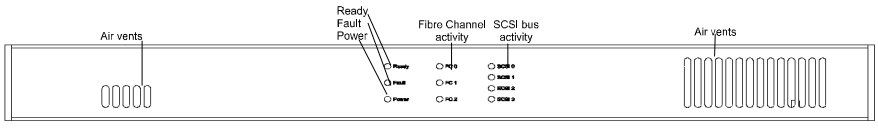
➔ Install the FibreBridge horizontally within the rack so it does not reduce the air flow within the rack. The maximum ambient temperature for the ATTO FibreBridge 4500R should not exceed 50° C

Exhibit 2.2-1 The ATTO FibreBridge 4500R/D: place horizontally on desktop or in rack. Note cooling pattern: overheating can shut down the FibreBridge. Do not block air vents.



FibreBridge 4500R/D overview

FibreBridge 4500R/D connector side



FibreBridge 4500R/D front

2.3 Connecting SCSI devices to SCSI ports

ATTO FibreBridge SCSI ports are used to connect SCSI storage devices into the Fibre Channel Storage Area Network (SAN).

A FibreBridge may have the following types of SCSI ports:

Ultra 2 (LVD) SCSI 80 MB/sec. max per bus

Single Ended Ultra SCSI 40 MB/sec. max per bus

High Voltage Differential (HVD) Ultra SCSI 40 MB/sec. max per bus

The high voltage differential (HVD) FibreBridge is compatible only with HVD SCSI devices. An LVD FibreBridge is downward compatible with Single Ended Ultra SCSI as well as Fast, Wide, or Narrow SCSI devices.

Each SCSI port is totally independent from the any other SCSI port. This means that each bus is capable of supporting 15 devices and each bus is capable of 40 or 80 MB/sec. (Ultra or Ultra2).

However, you may use externally provided software striping to create a RAID 0 group that includes devices from all SCSI busses to increase overall performance.

Another advantage of independent SCSI ports is that each SCSI bus auto-negotiates the appropriate sync rates with the connected devices. If slower devices are mixed with faster Ultra2 devices, the bus will communicate at the rate of the slowest device, thus wasting the performance capabilities of the faster devices. You should connect slower devices to one SCSI port and connect faster devices on another port on your FibreBridge.

The FibreBridge supports a wide variety of SCSI storage devices including stand-alone drives, removable drives, JBODs, RAIDs, tape, CD and DVD drives, changers, libraries and magneto optical drives.

To connect SCSI devices to the ATTO FibreBridge:

1 Connect a VHDCI SCSI connector from the SCSI device to a port on the FibreBridge 4500.

Check the type of cable and cable length limit for each port. It is important to keep cable lengths as short as possible to ensure the highest signal quality and performance. These cable lengths include the wiring inside the devices.

Device type	Cable limit
Ultra SCSI Single Ended (SE)	1.5 meters
Ultra SCSI High Voltage Differential (HVD)	25 meters
Ultra2 SCSI Low Voltage Differential (LVD)	12 meters

2 Set the IDs of the SCSI devices connected to the bridge to a value other than 7. You should use a sequential ID starting at 0 for each device. Each SCSI port in the ATTO FibreBridge has an internal factory setting ID of 7, typical for a SCSI initiator device.

NOTE The entire SCSI bus will operate at the speed of the slowest device. If you wish to mix devices of different SCSI speeds on the bridge, it is best to place them on separate busses. That is, put the slower devices on bridge SCSI busses 0 and 1, and the faster devices on bridge SCSI busses 2 and 3. Each bus is independent so each can operate at different speeds.

3 Terminate each SCSI bus after the last device. The bridge is terminated internally.

2.4 Connecting the Fibre Channel ports

The Fibre Channel ports on the ATTO FibreBridge 4500C/R/D connect the bridge into either a Fabric or Arbitrated Loop.

Fibre Channel technology offers a variety of cabling options including standard copper, equalized copper, multimode fiber optic, and single mode fiber optic.

The FibreBridge 4500C/R/D uses an SC fiber optic cable connector.

The type of cable to use varies depending upon the application, environment and distance. The following tables illustrate the different cable options available.

Make sure all cables are anchored securely at both ends with the proper connectors.

Cable length	Cable type	Cable size	Connector
Up to 175 meters	multi mode fiber optic	62.5 micron	SC optic connector
Up to 500 meters	multi mode fiber optic	50 micron	SC optic connector

3 Configuring the FibreBridge

Configuration of the ATTO FibreBridge, also known as FibreBridge Services, is available via ATTO BridgeTools (a graphical user interface configuration manager), Command Line Interface (CLI) or a menu.

FibreBridge Services includes displaying and modifying various attributes of FibreBridge operation, as well as the update of firmware. You may use a graphical interface (ATTO BridgeTools), command line interface (CLI) or menu system, depending on your FibreBridge model, your operating system, what you want to accomplish, and the method you are using to access FibreBridge services.

Command Line Interface (CLI)

The Command Line Interface provides access to FibreBridge Services through ASCII command lines. CLI is designed to be used by applications such as ATTO BridgeTools and experienced users. The initial display, after powering up the unit or restarting the firmware, will contain the information in Exhibit 3-1. Once the initial display is complete, with the word *Ready*, you are in the Command Line Interface mode.

Type *Help* to display a list of all commands available.

Menu mode

The Menu contains most commands available through CLI but in a hierarchal format. It follows a standard menu/choice model.

The initial display, after powering up the unit or restarting the firmware, will contain the information in Exhibit 3-1. Once the initial display is complete, with the word *Ready*, you are in the Command Line Interface mode. Type *Menu* and you will enter the menu system.

ATTO BridgeTools

The simplest way to communicate with the bridge is to use ATTO BridgeTools, a Java-based graphical interface configuration utility designed to flash firmware and manage the configuration for all models of the FibreBridge.

The ATTO BridgeTools program currently supports Sun Solaris 8, MAC OS 10.1 and Windows 95/98/ME, NT and 2000.

ATTO BridgeTools detects which FibreBridge model is available and presents you with the applicable configuration options. At the startup, a screen will present choices to communicate with the FibreBridge. You can choose between an in-band connection direct over the Fibre Channel link, an RS-232 port or an Ethernet port.

A tabbed panel interface presents configuration parameters in a simple, one-window display. Message boxes, icons, drop-down boxes, menu bars and other common graphical constructs lead you through the configuration process.

Refer to the ATTO BridgeTools Manual for complete instructions to how to install and operate the program.

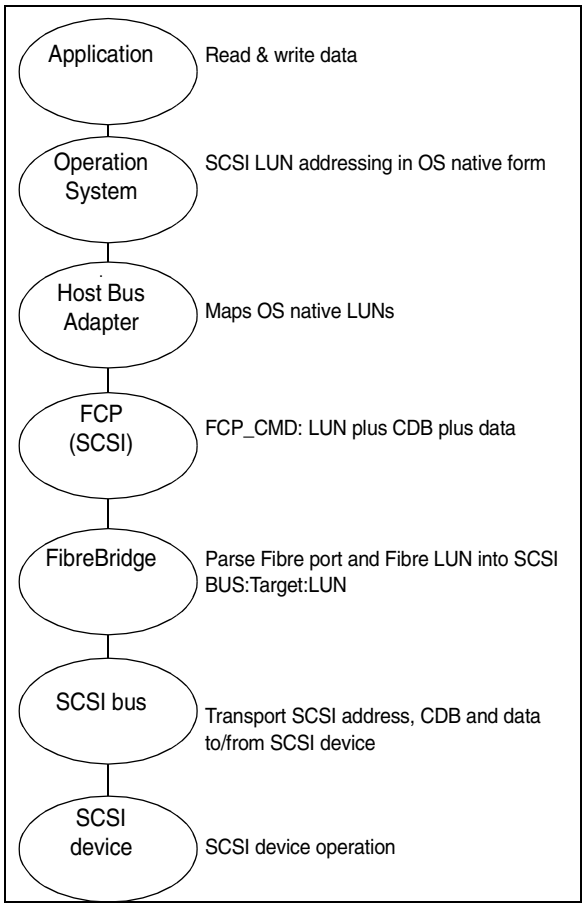
Exhibit 3-1 Post power up display. Type menu *to enter the menu system; type* help *for a list of CLI commands*

```
   ATTO FibreBridge 4500
(c) 2001 ATTO Technology, Incorporated.

Firmware version 002R release date Feb 14 2001, 16:01:43 Build
002R

Power-On Self-Test Completion Status: GOOD
64 Megabytes of RAM Installed.

3 1.0624 Gb/s Fibre Channel Interfaces.
4 LVD SCSI Interface Ports.

Interface 0 World Wide Name = 20 00 00 10 86 10 00 00
Interface 1 World Wide Name = 20 00 00 10 86 10 00 01
Interface 2 World Wide Name = 20 00 00 10 86 10 00 02

FibreBridge Serial Number = "FB4500L000000”
FibreBridge Name = "        “
Internal Temperature = 50 C [0 - 70]
ErrorLog Contents:  NO ERRORS
For help, type HELP.

Ready.
```

3.1 ATTO FibreBridge addressing

The ATTO FibreBridge allows parallel SCSI devices to participate in a Fibre Channel arbitrated loop or on a fabric. Fibre Channel and parallel SCSI use different models to address devices. The FibreBridge translates between these addressing models.

The chart below is a simplified overview of data and control flow between the application and the SCSI device through a number of stages.



Fibre Channel World Wide Name (WWN)

Each Fibre Channel device is assigned a unique World Wide Name (WWN). The WWN is used to identify all Fibre Channel devices. The 64-bit WWN has the following format:

Field Name	WWN Format		Company ID			Device ID		
Byte	0	1	2	3	4	5	6	7
Value	20	00	00	10	86	xx	xx	xx

The Institute of Electrical and Electronics Engineers (IEEE) assigns each manufacturer a unique Company ID. The Device ID field contains a unique value assigned by ATTO Technology to every Fibre Channel product produced by ATTO Technology.

Arbitrated Loop Port Address (AL_PA)

On a Fibre Channel Arbitrated Loop, the FibreBridge appears at a single Arbitrated Loop Port Address (AL_PA). Each device on an arbitrated loop is assigned a unique AL_PA during loop initialization. The FibreBridge supports both modes of AL_PA assignment, commonly referred to as *hard* and *soft addressing*.

Soft addressing allows the loop initialization master to assign the FibreBridge a unique AL_PA during the loop initialization process. The AL_PA assigned cannot be determined before loop initialization. For example, adding new devices to an arbitrated loop may change the AL_PA assigned to the FibreBridge.

Hard addressing allows a predetermined AL_PA to be assigned to the FibreBridge. The FibreBridge will try to acquire the desired hard AL_PA. If another device has already been assigned the specified AL_PA, the FibreBridge will acquire a currently unassigned AL_PA.

ATTO BridgeTools software allows you to select either hard or soft addressing modes. The default mode is soft addressing.

Addressing devices

SCSI devices connected to the FibreBridge also show up as Fibre Channel LUNs to the host computer. SCSI devices must be on the same addressing level as the SCSI portion of the FibreBridge. The FibreBridge SCSI ports must be set to different SCSI IDs than the devices on the bus.

3.1.1 Mapping devices

Access to SCSI devices is via Fibre Port and Fibre LUN addresses mapped to SCSI bus, target and LUN. CLI commands are used to modify the mapping.

The Command Line Interface commands *AutoMap*, *AddressMap* and *RouteXxxxx* map Fibre Channel ports and LUNs to SCSI bus/target/LUNs. Host applications use the Fibre port and Fibre LUN to access specific SCSI devices.

For information on how to access the CLI via a text interface or ATTO BridgeTools, a graphical interface, see Chapter 4 and Chapter 3.1.

AutoMap

AutoMap establishes the default map of Fibre ports and Fibre LUNs by distributing the devices over the Fibre ports you designate. To distribute all devices to across all the Fibre Channel ports, type

Automap

To assign a devices to specific ports, type in the port numbers you wish to use

Automap [0 | 1 | 2]

AddressMap A

AddressMap A enables mapping of any SCSI or internal device to a specific Fibre Channel port and LUN. Internal devices and external SCSI devices are presented as LUNs to a Fibre Channel host using route mapping. Each Fibre Channel port has its own Fibre Channel node name and port name. Type

AddressMap A

AddressMap B

AddressMap B enables port failover, the automatic substitution of the mapping from a failed port to a port reserved to take over for it. Internal devices and external SCSI devices are presented as LUNs to the Fibre Channel host using route mapping. Each Fibre Channel port has its own Fibre Channel node name and port name. The command configures the FibreBridge to either

➔ map all devices to one port, leaving one port offline and one port reserved to take over in case the active port fails:

set AddressMap B 1

➔ or map all devices across two ports, leaving the third reserved to take over in case either port fails:

set AddressMap B 2

To return an active port back to its pre-failover state, type

FcPortFailure recover

AddressMap C

AddressMap C uses static device addressing rather than route mapping to present internal devices and external SCSI devices as Fibre Channel LUNs to a host. All ports on the FibreBridge use the same Fibre Channel node name, but each port has a unique Fibre Channel port name.

The FibreBridge appears as a single Fibre Channel device with three ports to a host. All devices are available on each Fibre Channel port at the same LUN as follows:

Peripheral Device Addressing (internal FB LUNs)

BIT	7	6	5	4	3	2	1	0
LUN BYTE 1	0	0	Bus Identifier					
LUN BYTE 0	Target/LUN							

Logical Device Addressing (external SCSI devices)

Bit	7	6	5	4	3	2	1	0
LUN BYTE 1	1	0	Target					
LUN BYTE 0	Bus			LUN				

All Fibre Channel ports will report a particular device (both internal and SCSI) at the same LUN. The LUNs reported to a host in response to a *ReportLUNs* command will always contain both

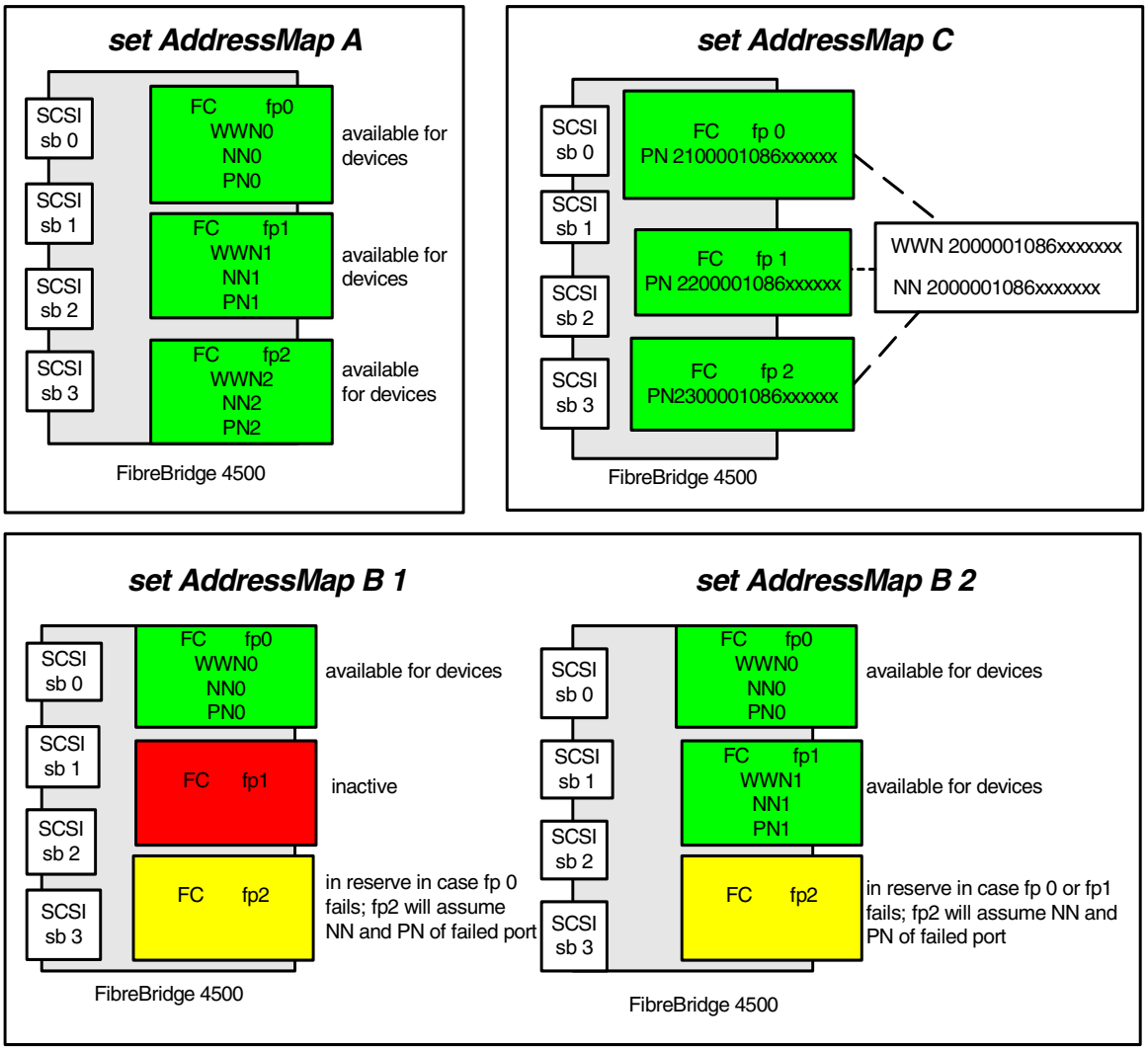
the FibreBridge and Services target LUN and the SCSI devices currently attached to the FibreBridge.

Several commands and features are not available in AddressMap C Mode: AutoMap, BootScanPorts, FibreBridgeTargetLUN, ServicesLUN, Route, RouteDisplay, RouteChange, RouteOnline, RouteOffline, SpeedWrite, SpeedWriteDefault.

Exhibit 3.1-1 Sample mappings for AddressMap C:

Internal Device:			FC LUN
FibreBridge LUN			0x0000
Services LUN			0x0001
SCSI Device:			
Bus	Target	LUN	FC LUN
0	0	0	0x8000
0	1	0	0x8100
0	2	1	0x8201
1	0	0	0x8020
2	3	0	0x8340
3	5	2	0x8562

Exhibit 3.1-1 NN=Node Name, PN=Port Name.



RouteXXX family

If you have not enabled AddressMap C, you may use CLI commands to find all the SCSI devices on SCSI busses. With this information you then decide where you want to place these devices on the Fibre Channel ports.

You can then manually map the devices using the RouteXXX family of commands or the *AutoMap* command (see Chapter 4.1.8) available through the Command Line Interface or the menu or by using ATTO BridgeTools (see Chapter 4 and Chapter 3.1).

RouteDisplay displays the current mapping, if AddressMap C has not been enabled, in Fibre port, Fibre LUN order, showing the mapped SCSI bus/target/LUN, and the current status of the device (online, offline, disabled, mapped, unmapped). RouteDisplay may be used at any time.

RouteOffline, RouteChange, and RouteOnline modify the mapping as required to make a device inaccessible, to replace a non-functioning mapped unit with another or to manage wear on tape drives. The commands will not modify a port being used as a failover port in AddressMap B mode.

In the chart at right, the SCSI device on SCSI bus 0 at SCSI address of ID 0 LUN 0 is being mapped to Fibre Port 0 (on the FibreBridge) at Fibre Channel LUN 4.

Note: two SCSI devices cannot be mapped to the same Fibre Port and Fibre Channel LUN. Also, if the same SCSI device is mapped to two different Fibre Port and/or Fibre Channel LUNs, these Fibre Port and Fibre Channel LUNs will be taken offline automatically until the conflict is resolved.

Fibre Port	FC LUN	SCSI BUS	SCSI ID	SCSI LUN
0	4	0	0	0
2	0	0	1	0
1	2	1	13	0
2	0	1	15	0
0	3	2	1	0
2	10	2	1	1
0	30	3	8	5
1	23	3	8	7

The *BootScan* command (see Chapter 4.1.8), available through the Command Line Interface, ATTO BridgeTools or the menu (see Chapter 3.1 and Chapter 4), provides dynamic mapping of SCSI devices to Fibre port/LUN combinations via a SCSI bus scan at boot time. Each time the FibreBridge is reset or power-cycled and BootScan is enabled, a bus scan will occur on all SCSI busses. All devices discovered during the bus scans will be assigned to a Fibre port, Fibre LUN combination until the next reset/power cycle. The dynamic mapping will replace the current mapping of the FibreBridge.

3.2 Handling multiple initiators

Several Fibre Channel hosts or initiators may initiate commands through the FibreBridge to SCSI devices. The basic mechanism to resolve possible conflicts among initiators is to use SCSI Reserve *and* Release *commands.*

A Fibre Channel host may need exclusive access to a SCSI device. SCSI *Reserve* and *Release* commands allow logical units to be reserved or released under host control.

The FibreBridge intercepts any Reserve or Release command from a Fibre Channel host, performs initial processing and, if appropriate, relays the Reserve command to the SCSI device.

In a FibreBridge environment, the identity of the initiator (WWN) is not relayed to the SCSI device. A two-step process addresses initiator identity in the FibreBridge, and reserves the SCSI device on behalf of the FibreBridge.

Initiators on both the Fibre Channel (via the FibreBridge) and on the SCSI bus may initiate reserve and release commands to the SCSI devices.

The FibreBridge processing of reserve and release commands involves two tiers of verification. The first tier is within the FibreBridge; the second tier is within the SCSI device.

1 **The FibreBridge receives a SCSI** Reserve **command.**

Tier 1

2 **The FibreBridge determines, via its internal database, whether there are conflicting concurrent reservations from Fibre Channel hosts for the target SCSI device.**

3 **If there is a conflict, the FibreBridge returns a check condition with** reservation conflict **to the initiator.**

4 **If there is no conflict, the FibreBridge marks the SCSI device as reserved in its internal database.**

Tier 2

5 **The FibreBridge relays the** Reserve **command to the SCSI device.**

6 **The SCSI device determines whether it is already reserved.**

7 **If the SCSI device is already reserved, it returns a** reservation conflict **to the FibreBridge. The FibreBridge removes its reserved indicator in its internal database, and returns** reservation conflict **to the initiator.**

8 **If the SCSI device was not previously reserved, the SCSI device is reserved and returns** success **to the FibreBridge. The FibreBridge then returns** success **to the initiator.**

The FibreBridge does not implement extent reservation.

Single initiator

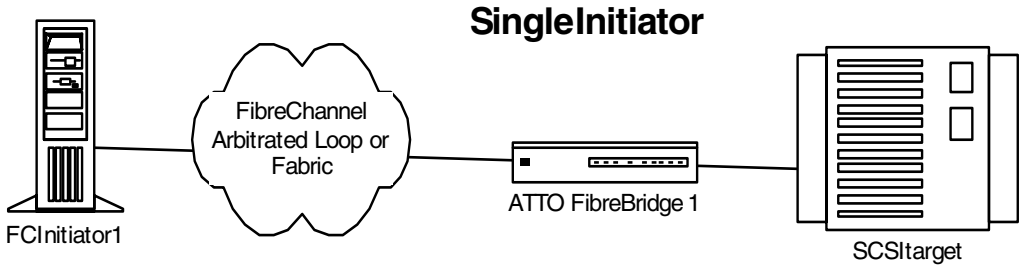
A single initiator presents no conflicts.

1 **A single Fibre Channel initiator sends the** Reserve **command through the SAN to the FibreBridge**

2 **The FibreBridge determines that no reservation conflict exists at Tier 1.**

3 **The FibreBridge sends the** Reserve **command to the SCSI target.**

4 **The SCSI target is reserved until a** Release **command is sent by the Fibre Channel initiator.**



Multiple Fibre Channel initiators

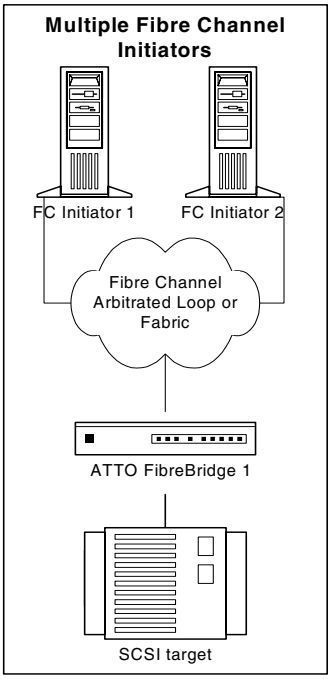
Multiple Fibre Channel initiators share a Fibre Channel connection on the SAN with a Fibre Bridge, and there are no other initiators on the SCSI bus.

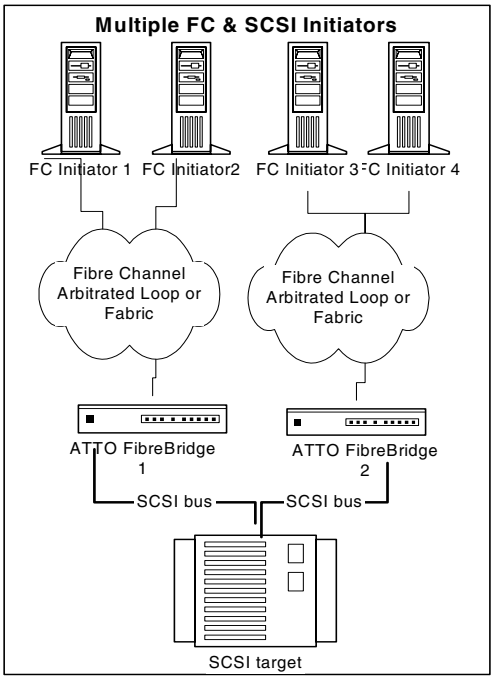
1 **Fibre Channel Initiator 1 sends the** Reserve **command through the SAN to the FibreBridge.**
2 **The FibreBridge determines that no reservation conflict exists at Tier 1.**
3 **The FibreBridge records the initiator ID (WWN) in its internal database.**
4 **The FibreBridge sends the** Reserve **command to the SCSI target.**
5 **The initiator is notified of reservation success: the SCSI target is reserved.**
6 **Fibre Channel Initiator 2 sends the** Reserve **command through the SAN to the FibreBridge.**
7 **The FibreBridge determines the SCSI device is already reserved.**
8 **The FibreBridge rejects Fibre Channel Initiator 2's command and returns** reservation conflict.
9 **The SCSI target remains reserved until a** Release **command is sent by Fibre Channel Initiator 1.**

Multiple FC & SCSI initiators

Several Fibre Channel initiators share a Fibre Channel connection on the SAN with a FibreBridge, and several initiators share the SCSI bus.

1 **Fibre Channel Initiator 1 sends the** Reserve **command through the SAN to FibreBridge 1 for a SCSI target.**
2 **FibreBridge 1 determines that no reservation conflict exists at Tier 1.**
3 **The FibreBridge records the initiator ID (WWN) in its internal database.**
4 **Fibre Bridge 1 sends the** Reserve **command to the SCSI target.**
5 **The initiator is notified of reservation success: the SCSI target is reserved.**
6 **Fibre Channel Initiator 3 sends the** Reserve **command through the SAN to FibreBridge 2.**
7 **FibreBridge 2 determines that no reservation conflict exists at Tier 1.**
8 **FibreBridge 2 records the initiator ID (WWN) in its internal database.**
9 **FibreBridge 2 sends the** Reserve **command to the same SCSI target.**
10 **The SCSI target is already reserved by FibreBridge 1 and rejects FibreBridge 2's reserve command.**
11 **SCSI Target returns** reservation conflict **to FibreBridge 2.**
12 **FibreBridge 2 removes its internal reserve indicator for the initiator.**
13 **FibreBridge 2 returns** reservation conflict **to Fibre Channel Initiator 3.**
14 **The SCSI target remains reserved by Fibre Channel Initiator 1.**





4 Accessing ATTO FibreBridge Services

Communicate with the ATTO FibreBridge through the RS-232 serial port, the Fibre Channel port or the Ethernet port using ATTO BridgeTools, Command Line Interface or a menu.

ATTO FibreBridge Services configure and tune the bridge for many different environments and applications, update the firmware, configure the addresses of the connected SCSI devices, monitor internal power and temperature status, report on hardware diagnostics and log failures.

Three avenues are available:

- ➔ In-band SCSI over Fibre Channel
- ➔ RS-232 port
- ➔ Telnet over Ethernet

The next chapters of this manual provide details on using the Command Line Interface and menu system to access FibreBridge Services. Refer to the ATTO BridgeTools manual for complete instructions on how to use the program.

CAUTION Any changes must be saved and will not take effect until the ATTO FibreBridge is restarted.

Access the ATTO FibreBridge through in-band SCSI over Fibre Channel

One way to access the ATTO FibreBridge through in-band SCSI over Fibre Channel is to use ATTO BridgeTools, a Java-based graphical interface configuration utility, to flash firmware and manage configuration for many FibreBridge models. The ATTO BridgeTools program currently supports Sun Solaris™ 8, MAC® OS 10.1 and Windows® 95/98/ME, NT and 2000.

Refer to the ATTO BridgeTools Installation and Operation Manual for complete instructions to how to install and operate the program.

In-band SCSI commands (Write Buffer and Read Buffer) may be issued to the FibreBridge to manage configuration via two mechanisms:

- ➔ In-band CLI over SCSI, where ASCII CLI (services) commands, may be issued via *Write Buffer*. All CLI commands except *Menu* are supported. Refer to Chapter 4.4.
- ➔ Buffer ID/value, where the application program uses a SCSI CDB (command descriptor block) to select the buffer ID of the configuration parameters to be affected, and the new value of the parameter. Most FibreBridge configuration options are available.

Access the ATTO FibreBridge over the RS-232 port

The ATTO FibreBridge supports remote service operations over the RS-232 serial port using standard terminal emulation software available with most systems.

1. **Connect a DB-9 crossover serial cable (null modem) between the ATTO FibreBridge serial port and one of the computer's serial COM ports. A gender changer or DB-9 to DB-25 converter may be needed depending on the cables being used.**
2. **Enable the computer's serial port and initiate a terminal emulation link.**
3. **Set the following serial parameters in your terminal program: Bits per second: 9600, Data Bits: 8, Parity: None, Stop Bits: 1, Flow Control: None. Use ASCII as the terminal type. Echo should be on.**
4. **You may use a graphical interface (ATTO BridgeTools), command line interface (CLI) or menu system as explained in the rest of this manual.**

Configure the ATTO FibreBridge for a network over the Ethernet port

The 10/100 BaseT Ethernet port provides Telnet-based monitoring and management. If DHCP is turned off (the default), the default IP address is 10.0.0.1; the default subnet mask is

255.255.255.0. You don't need to do anything more if you want to use the default, but these parameters can be changed using the RS-232 port or Telnet. The ATTO FibreBridge should first be configured for the network using the RS-232 port to establish the correct IP address.

To set up the IP Address using the RS-232 port and the menu system:

1 **Connect a DB-9 serial cable to the ATTO FibreBridge serial port and establish a link.**
2 **Enter the menu system by typing MENU at the prompt**
3 **At the Main Menu, select** FibreBridge Configuration
4 **At the FibreBridge Configuration Menu, select** Network Configuration
5 **At the Network Configuration Menu, select** IP Address
6 **Enter the desired IP Address**

To set the IP Subnet Mask:

1 **At the Main Menu, select** FibreBridge Configuration
2 **At the FibreBridge Configuration Menu, select** Network Configuration
3 **At the Network Configuration Menu, select** IP Subnet Mask
4 **Enter the desired IP Subnet Mask**

To set the IP Gateway:

1 **At the Main Menu, select** FibreBridge Configuration
2 **At the FibreBridge Configuration Menu, select** Network Configuration
3 **At the Network Configuration Menu, select** IP Gateway
4 **Enter the desired IP Gateway**

To set the FibreBridge Name:

1 **At the Main Menu, select** FibreBridge Configuration
2 **At the FibreBridge Configuration Menu, select** FibreBridge Name [" "]
3 **Enter the desired FibreBridge Name. The name can be no more than eight characters. Choose a meaningful name to make identification of the unit easier.**

To save the configuration:

1 **At the Main Menu, select** Save/Restore Configuration
2 **At the Save/Restore Configuration Menu, select** Save Configuration
3 **Select** Restart **to save the configuration and restart the FibreBridge**

Access the ATTO FibreBridge using Telnet or FTP over Ethernet

To access the ATTO FibreBridge via Ethernet:

1 **Connect an Ethernet cable between the FibreBridge and a 10/100Base T connection. You may need a crossover cable connecting directly to a computer. The ATTO FibreBridge will auto detect the Ethernet speed if configured to do so.**
2 **Access using any standard Telnet program.**

To connect via Telnet:

1 **Supply the IP address to the Telnet program. The local echo should be set to** *on* **if the Telnet software supports it. Use Vt100 for communication.**
2 **Verify that the bridge can be accessed on the local Ethernet by using the Ping utility. On most systems, type** ping <IP Address>**. If the FibreBridge does not respond, it may not be connected correctly to the network, or is somehow unreachable by the computer from which it is being pinged. Check network connections and security as well as the ATTO FibreBridge.**

To set up and configure FTP:

1 **Ensure that the FTP program is in binary mode. Access the ATTO FibreBridge at the IP address that was previously set (or the default).**
2 **Log into the ATTO FibreBridge. The username the bridge will accept is** *sysadmin***. Enter** *userid* **as the password.**

4.1 Command line use and guidance

The command line interface (CLI) provides access to the ATTO FibreBridge Services through a set of ASCII commands. CLI commands may be entered while in CLI mode.

FibreBridge Services provide configuration and monitoring for the FibreBridge. Other programs and "power users" use the command line interface (CLI), a set of ASCII-based commands, to perform these tasks. CLI commands may be entered while in CLI mode.

➔ CLI commands are context sensitive and generally follow a standard format:

[Get | Set] Command [Parameter 1 | Parameter 2] followed by the *return* or *enter* key

➔ CLI commands are case insensitive: you may type all upper or all lower case or a mixture. Upper and lower case in this manual and the *help* screen are for clarification only.

➔ Commands generally have three types of operation: get, set and immediate.

➔ The **get** form returns the value of a parameter or setting and is an informational command.

Responses to get commands are specified in the ***Results*** field for each command, followed by *Ready.*

➔ The **set** form is an action that changes the value of a parameter or configuration setting. It may require a **SaveConfiguration** command and a restart of the system before it is implemented. The restart can be accomplished as part of the **SaveConfiguration** command or by using a separate **FirmwareRestart** command. A number of set commands may be issued before the **SaveConfiguration** command.

Responses to **set** commands are either an error message or *Ready.* *. The asterisk indicates you must use a **SaveConfiguration** command to finalize the **set** command. **SaveConfiguration** will ask whether you want to restart the system or not.

➔ Set commands which do not require a **SaveConfiguration** command, defined as immediate commands, are immediately executed.

Responses to Immediate commands are either an error message or data results followed by *Ready.*

Exhibit 4.1-1 Symbols, typefaces and abbreviations used to indicate functions and elements of the command line interface used in this manual.

Command conventions

Symbol	Indicates
[ ]	Required entry
< >	Optional entry
|	pick one of
…	Ellipses, repetition of preceding item
\n	end of line
-	a range (6 – 9 = 6, 7, 8, 9)
Boldface words	must be typed as they appear
Italicized words	Arguments which must be replaced by whatever they represent
fl	Fibre Channel LUN number (0 <= fl <= 31)
fp	Fibre Channel port number (0 <= fp <= 2)
sb	SCSI bus number (0<= sb <= 3)
sl	SCSI LUN ID (0 <= sl <= 7)
st	SCSI target ID (0 <= st <= 15)

4.1.1 General use commands

The CLI commands outlined in this chapter get information or perform functions which are used in a variety of situations with the FibreBridge.

Help

Displays a list of available commands. If command name is specified, displays detailed command-specific information.

Action: **none** Information: **Help [command name]**

Menu

Turns the menu interface on or off. If the interface is on, other parameters such as ECHO will also be enabled.

Action: **none** Information: **Menu**

RestoreConfiguration

Restores configuration to either the default configuration or the configuration last saved into non-volatile memory. The saved option will undo any changes made since the last save.

Actions: **RestoreConfiguration [Default | Saved]** Information: **none**

SaveConfiguration

Many commands require a SaveConfiguration command to be executed. This will be indicated by the return Ready. *. When you invoke SaveConfiguration, the current configuration is permanently saved in the FibreBridge and the new configuration becomes the active configuration. If a firmware restart is required to make the requested change permanent, you will see a prompt asking you to confirm the restart. You can override this request by indicating the override value on the command line. You may make several changes through commands and SaveConfiguration before implementing the restart, but once you have restarted the FibreBridge, all the command changes created before the restart and save will be implemented. If you select the restart option, the FibreBridge will execute its complete start up cycle.*

Limits: Restart or no Restart parameter is optional

Actions: **SaveConfiguration <Restart| NoRestart>** Information: **none**

Returns: [Configuration saved |
Restart is necessary...
Do you wish to restart (y/n)? y
Restarting...]

SerialNumber

Reports the FibreBridge serial number which is unique for each FibreBridge. The serial number tracks the board throughout its life and should not be changed for any reason.

Limits: set form requires operator privileges

Actions: **set SerialNumber** Information: **get SerialNumber**

Verbose return:
Part Identifier: PPPPPPP Sequence Number: nnnnnn

VerboseMode

Specifies the detail of feedback for the command line interface. Disabling this option removes parameter names from action commands and removes descriptions from information commands.

Limits: enabled or disabled Default: enabled (returns have parameter information)

Actions: **set VerboseMode [enabled | disabled]** Information: **get VerboseMode**

4.1.2 Diagnostic commands

ATTO FibreBridge diagnostic commands help validate FibreBridge operation and diagnose/isolate FibreBridge faults through the Event Log.

Event logging is a mechanism for on-site observation of internal FibreBridge behavior such as tracing SCSI commands received over the Fibre Channel from the host and return of data and status to the host.

ClearEvent

Clears the contents of the event log.

Actions: **ClearEvent**

Information: **none**

DispEvent

Sets the switches which control the filtering performed when displaying events.

Limits: To display from several different subsystems or events, use a mask value equal to the logical OR of the corresponding values. To display events from all subsystems, enter [0x7F] as the mask

Default: [0x7F] 0x3F] [all]

[subsystem] controls which subsystem's events display
0x01 FCP Processor/i960 Interaction
0x02 SCSI Processor/i960 Interaction
0x04 Ethernet
0x08 Extended copy
0x20 NVRAM & Flash
0x40 ECC & Parity

[event_level] controls what report level events display
0x01 Info: general information
0x02 Warning: unexpected situation/condition
0x04 Critical: operation limited/curtailed
0x08 Failure: hard failure
0x10:Other
0x20 Debug: ATTO tracking events

[status] [all]: all events regardless of status values
[ngood]: only events with a status value other than good

Actions: **set DispEvent [subsystem] [event_level] [status]**

Information: **getDispEvent**
Verbose return: DispEvent=SubSys:0xXX Lv1:0xXX
Status: [all | no good]

SaveConfiguration

DispFcPortDB

Displays the contents of the specified FC port's internal port database which contains Fibre Channel addressing information for each FC target device visible to the FibreBridge.

Action: **none**

Information: **DispFcPortDB <fp>**

Returns: Node name, 24-bit port ID, 8-bit internal loop ID of each FC device

DisplayEvent

Results in a display of the current contents of the event log to the display. The log is filtered by the current switch settings as described in the DispEvent command. If the optional all *parameter is provided, the display filtering is temporarily suspended and all logged events are displayed regardless of the current event filter switch settings.*

Actions: **DisplayEvent <all>**

Information: **none**

EccLog

Contains the ECC error statistics for the FibreBridge since the statistics were last cleared. Set form sets the statistics to zero.

Limits: Maximum number of errors reported = 65535

Actions: **set EccLog clear**

Information: **get EccLog**

ErrorLog

Set form clears ErrorLog since previous error reported. Get form shows error messages since the report was last cleared.

Actions: **set ErrorLog clear**

Returns: Error Logs cleared

Information: **get ErrorLog**

Returns: The last error code save was xx
An error of type xxx was detected since last error log clearing
Specific error text.

FcPortList

Returns a list of available Fibre Channel ports and their current status.

Limits: valid status values are OK and Failed

Actions: **none**

Information: **FcPortList**

Returns: [line count] [fp] [status]

FcSCSIBusyStatus

Specifies the SCSI status value returned when the FibreBridge is unable to accept a SCSI command because of a temporary lack of resources.

Limits: [busy | qfull]

Default: busy

Actions: **set FcSCSIBusyStatus [busy | qfull]**
SaveConfiguration

Information: **get FcSCSIBusyStatus**

FcTargets

Obtains information about every Fibre Channel target device visible to a FibreBridge operating in initiator mode; devices may be used as targets for initiator mode features such as Extended Copy.

Actions: **none**

Information: **FcTargets**

Returns: Node Name, FC LUN & inquiry data for each FC device found

FcWWName

Reports the Word Wide Name (WWN) of the Fibre Channel interface. Each FC port has an individual and unique WWN. The least significant 6 bits of the WWN are used as the Ethernet MAC address.

Limits: Fabric and loop operations are unpredictable if duplicate WWNs are assigned.

Actions: **none**

Information: **get FcWWN [PortNumber]**

Return: Port n FcWWName= 20 00 00 10 86 nn nn nn

FibreBridgeModel

Reports model information about a specific FibreBridge

Action: **none**

Information: **get FibreBridgeModel**

Returns:
FibreBridge 4500
©2002 ATTO Technology, Incorporated
Firmware version mm..mm release date mm.dd.yyyy, hh:mm:ss
Build zzzz

FibreBridgeName

Specifies the eight-character name assigned by you to the FibreBridge used to identify individual FibreBridge units. It is not the World Wide Name (WWN). The name is padded with spaces to the maximum of eight characters.

Actions: **set FibreBridge Name [value]**
SaveConfiguration

Information: **get FibreBridgeName**

Help

Displays a list of available commands. If command name is specified, displays detailed command-specific information.

Action: **none**

Information: **Help [command name]**

IdentifyFibreBridge

Enabling this option causes the Ready LED on the front panel of the FibreBridge to blink until the parameter is disabled.

Actions: **set IdentifyFibreBridge [enabled|disabled]**

SaveConfiguration

Information: **get IdentifyFibreBridge**

Info

Displays version numbers and other product information for key components within the FibreBridge

Action: **none**

Information: **Info**

LogEvent

Sets the switches which control the filtering performed when logging events.

Limits: To display from several different subsystems or events, use a mask value equal to the logical OR of the corresponding values. To display events from all subsystems, enter [0x7F] as the mask

Default: [disabled]

[subsystem] controls which subsystem's events display
0x01 FCP Processor/i960 Interaction
0x02 SCSCI Processor/i960 Interaction
0x04 Ethernet
0x08 Extended copy
0x20 NVRAM & Flash
0x40 ECC & Parity

[event_level] controls what report level events display
0x01 Info: general information
0x02 Warning: unexpected situation/condition
0x04 Critical: operation limited/curtailed
0x08 Failure: hard failure
0x10 Other;
0x20 Debug: track events

[status] [all]: all events regardless of status values
[ngood]: only events with a status value other than good

Actions: **set LogEvent [enabled | disabled] | [[subsystem] [event_level] [status]]**
SaveConfiguration

Information: **getLogEvent**

OEMConfigFile

Reports the name of the OEM Configuration file stored in persistent memory. If no file is present, ATTO *is returned. The file contains all the CLI commands that can be used to override the factory default settings of the FibreBridge. Updates may be loaded via any of the current firmware update methods.*

Action: **none**

Information: **get OEMConfigFile**

ParityLog

Contains the parity error statistics for the FibreBridge since the statistics were last cleared. The set form sets the statistics to zero.

Limits: 65,535 maximum number of errors

Action: **set ParityLog clear**
SaveConfiguration

Information: **get ParityLog**
Returns:
Parity Errors:
FibreChannel 0xnnn
SCSI 0xnnn

Performance

Returns the performance data for the Fibre Channel port you specify. Data includes the average rate (MBs per sec.) and number of I/Os measured over the previous sampling period where a sampling period is approximately one second. Requesting performance data for a FC port which has been disabled or has failed will result in the display of an error message ("ERROR Disabled Fibre Channel port" or "ERROR Failed Fibre Channel port"). Reported performance may be affected by FC port and SCSI bus availability and saturation, SCSI device speeds and overall system use.

Limits: Successful SCSI Read (08h, 28h) and Write (0Ah, 2Ah) commands are considered I/Os.
Valid FC port (fp) entries are [0|1|2]

Actions: **none**

Information: **get Performance <fp>**
Verbose return:
[line count]
; fp MB/s IO/s
[fp] [mmm.mmm] [nnn]

POSTOutput

Returns the stored output of the most recent Power On Self Test.

Action: **none**

Information: **get POSTOutput**

ScsiPortList

Returns a list of available SCSI ports and their current status

Limits: valid status values are OK and Failed

Action: **none**

Information: **ScsiPortList**

ScsiTargets

Returns a list of SCSI devices operational on the referenced SCSI port.

Action: **none**

Information: **ScsiTargets [sb]**

Returns: [line count]
[sb] [st] [sl] [device type] [vendor ID] [product ID] [revision] [serial number]

Temperature

Returns the current internal temperature of the unit in degrees Celsius.

Actions: **none**

Information: **get Temperature**

XCDevices

Allows you to get information about the devices used in a particular Extended Copy command specified by the CmdNumber as presented in the XCStatus CLI command (see below).

Limits: *DeviceType* displays SCSI device type
VendorId, Product Id, SerialNumber display SCSI inquiry data for each device
DataDirection specifies whether a device is a data source, a data destination or both.

Action: **none**

Information: **get XCDevices [CmdNumber]**

Return: [lineCount]
DeviceType VendorID ProductID SerialNumber DataDirection
[SCSI type] [VendID] [ProdId] xxxxxxxxxxxxxxx [DataDir]

XCError

Retrieves any SCSI sense data returned by an Extended Copy command because of an error.

Limits: *CmdNumber* is the data returned by the XCstatus command (see below).
SCSI Status, *SenseKey, ASC* and *ASCQ* fields display the sense data returned by the Extended Copy command
If a device also returns sense data, the device's serial number will be displayed in the *DeviceId* field; its data will be displayed in the *DStat, DSK, DASC* and *DASCQ* fields.
Any field that does not contain valid data will be filled in with 00.

Action: **none**

Information: **get XCError [CmdNumber]**

Return: [lineCount]
SCSI status SenseKey ASC ASQ DeviceID DStat DSK DASC DASCQ
xx xx xx xx [SerNum] xx xx xx xx

XCStatus

Polls the status of Extended Copy commands issued to the FibreBridge.

Limits: *CmdNumber* is unique identifier for a particular command.
ListId displays List ID specified in the CDB of the extended copy command.
HostId field displays 8-byte Node Name of FC host that issued Extended Copy command
Status indicates current state of Extended Copy command [Initializing|Active|Done|Error}
Transferred displays the amount of data transferred in megabytes.

Action: **none**

Information: **get XCStatus**

Return: [lineCount]
CmdNumber ListID HostId Status Transferred (MB)
[CmdNumber] [xxxx] [host NN] [cmd status] [xxxxxxxx]

4.1.3 Maintenance commands

The CLI commands outlined in this chapter may be used to get information or perform functions which are used in a variety of situations with the ATTO FibreBridge.

FirmwareRestart

Causes the FibreBridge to reboot, then re-initialize its firmware.

Actions: **FirmwareRestart** Information: **none**

FixedLengthReqSense

If enabled, forces the FibreBridge to pad the number of bytes of autosense data returned as a result of a CHECK CONDITION to a mod 4 *length.*

Default: disabled

Action: **set FixedLengthReqSense [enabled|disabled]** Information: **get FixedLengthReqSense**

IsReserved

Displays the reservation status of the current FibreBridge session/interface. If set, the configuration image is being modified by another FibreBridge services session: set commands are temporarily unavailable but information commands are available. Executing a SaveConfiguration, RestoreConfiguration or FirmwareRestart RELEASES the FibreBridge so that other services users may access it.

Limits: When FibreBridge services interface is RESERVED, set commands from other users are unavailable.
At least one interface must always have access to the FibreBridge.

Action: **none** Information: **IsReserved**

Return: [NOT set | set]

MaxEnclTempAlrm

Sets/displays the maximum enclosure temperature alarm of the unit in degrees Celsius. If the temperature of the FibreBridge rises above the maximum MaxEnclTempAlrm, thermal control event handling occurs.

Limits: valid entries are between 0 and 70 degrees and above the current minimum enclosure temperature alarm

Default: 70° C

Actions: **set MaxEnclTempAlrm [0-70]** Information: **get MaxEnclTempAlrm**

SaveConfiguration

MinEnclTempAlrm

Sets/displays the minimum enclosure temperature alarm of the unit in degrees Celsius. If the temperature of the FibreBridge falls below the minimum MinEnclTempAlrm, thermal control event handling occurs.

Limits: valid entries are between 0and 70 degrees and below the current maximum enclosure temperature alarm

Default: 0° C

Actions: **set MinEnclTempAlrm [0-70]** Information: **get MinEnclTempAlrm**

SaveConfiguration

Reserve

Reservation of the FibreBridge is implicit: once the configuration image is changed by any user of services, the FibreBridge becomes RESERVED. Executing a SaveConfiguration, RestoreConfiguration or FcRestart RELEASES the FibreBridge so that other services users may access it.

Limits: When FibreBridge services interface is RESERVED, set commands from other users are unavailable.
At least one interface must always have access to the FibreBridge.

Action: **Reserve** Information: **none**

Return: [enabled | disabled]

RestoreConfiguration

Restores configuration to either the default configuration or the configuration last saved into non-volatile memory. The saved option will undo any changes made since the last save.

Actions: **RestoreConfiguration [Default | Saved]** Information: **none**

ScsiPortReset

Resets the specified SCSI bus.

Actions: **ScsiPortReset [sb]** Information: **none**

SpeedWrite

SpeedWrite is a method to improve the performance of FCP WRITE commands to SCSI devices attached to the FibreBridge. You can specify the SCSI bus, target and LUN of a mapped device or specify "all" to set or get the state of all currently mapped SCSI devices.

Limits: enabled, disabled

Actions: **set SpeedWrite [sb st sl |all] [enabled |disabled]**

Information: **get SpeedWrite [sb st sl |all]**

SaveConfiguration

SpeedWriteDefault

Specifies the state of SpeedWrite for any SCSI devices mapped manually or via an AutoMap operation. If enabled, any new SCSI device will use SpeedWrite performance enhancement by default.

Limits: enabled, disabled

Actions: **set SpeedWriteDefault [enabled |disabled]**

Information: **get SpeedWriteDefault**

SaveConfiguration

Zmodem

Allows transfer of a firmware image to or from the FibreBridge using the ZMODEM file transfer protocol.

Limits: available only through the RS232 interface

WARNING After a firmware image is downloaded to the FibreBridge, the image is placed into flash memory. During this time (about 30 seconds), DO NOT remove power to the FibreBridge or the flash may become corrupted.

Actions: **Zmodem [Send filename | Receive]**

Information: **none**

Returns: ZMODEM transfer complete on success
ERROR with status message on failure

CLI Error Messages

The following error messages may be returned by the Command line Interface:

ERROR. Invalid Command. Type 'Help' for command list.

ERROR. Wrong/Missing Parameters

Usage: <usage string>

ERROR. Command Not Processed.

4.1.4 SCSI configuration commands

The SCSI ports are configured with default settings but may be customized to your specifications using the CLI commands in this section.

ScsiInitID

Specifies the SCSI initiator ID to be used on the specified SCSI port. All maps coinciding with the user-specified ScsiInitID must be set to offline *and will become invalid upon issuing this command*

Limits: [0-15] wide [0-7] narrow

Action: **set ScsiInitID [sb [0-15]]** Information: **get ScsiInitID**

SaveConfiguration

ScsiPortBusSpeed

Controls the transfer rate at which the FibreBridge will attempt to negotiate with its SCSI devices.

Limits: Fast SCSI, Ultra SCSI, Ultra 2 SCSI (valid only if FibreBridge has LVD-capable SCSI ports)

Actions: **set ScsiPortBusSpeed [Port Number [fast| ultra| ultra2]** Information: **get ScsiPortBusSpeed**

SaveConfiguration

ScsiPortList

Returns a list of available SCSI ports and their current status

Limits: valid status values are OK and Failed

Action: **none** Information: **ScsiPortList**

ScsiPortReset

Resets the specified SCSI bus.

Actions: **ScsiPortReset [sb]** Information: **none**

ScsiPortResetOnStartup

Specifies whether the SCSI port should be reset on power-up or not

Limits: [enabled | disabled] Default: enabled

Action: **set ScsiPortResetOnStartup [sb [enabled | disabled]]** Information: **get ScsiPortResetOnStartup [sb]**

SaveConfiguration

ScsiPortSelTimeout

Indicates the time, in milliseconds, that the bridge waits for a response from a SCSI device on the selected port after a selection request. Setting a long selection time-out value can result in the host generating system time-out.

Limits: [256| 128|64|32|16|8|4|2|1] Default: 256 ms

Action: **set ScsiPortSelTimeout [sb [256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1]]** Information: **get ScsiPortSelTimeout [sb]**

SaveConfiguration

ScsiPortSyncTransfer

Specifies whether synchronous SCSI transfers should be negotiated with devices on the specified SCSI port.

Limits: [enabled | disabled] Default: enabled

Action: **set ScsiPortSyncTransfer [[sb [enabled | disabled]]** Information: **get ScsiPortSyncTransfer [sb]**

SaveConfiguration

ScsiPortTaggedQueuing

Specifies whether tagged command queuing is allowed on the SCSI port.

Limits: [enabled | disabled] Default: enabled

Action: **set ScsiTaggedQueuing [sb [enabled|disabled]]** Information: **get ScsiTaggedQueuing [sb]**

SaveConfiguration

ScsiPortWideTransfer

Specifies whether wide SCSI transfers should be negotiated.

Default: enabled

Action: **set ScsiPortWideTransfer [sb[enabled|disabled]]**

Information: **get ScsiPortWideTransfer [sb]**

SaveConfiguration

ScsiTargets

Returns a list of SCSI devices operational on the referenced SCSI port.

Action: **none**

Information: **ScsiTargets [sb]**

Returns: [line count]
[sb] [st] [sl] [device type] [vendor ID] [product ID] [revision] [serial number]

ScsiTermination

Configures/reports the SCSI internal termination of the SCSI port identified.

Default: enabled

Action: **set ScsiTermination [sb [enabled | disabled]]**

Information: **get ScsiTermination [sb]**

SaveConfiguration

SpeedWrite

SpeedWrite is a method to improve the performance of FCP WRITE commands to SCSI devices attached to the FibreBridge. You can specify the SCSI bus, target and LUN of a mapped device or specify "all" to set or get the state of all currently mapped SCSI devices.

Limits: enabled, disabled

Actions: **set SpeedWrite [sb st sl |all] [enabled |disabled]**

Information: **get SpeedWrite [sb st sl |all]**

SaveConfiguration

SpeedWriteDefault

Specifies the state of SpeedWrite for any SCSI devices mapped manually or via an AutoMap operation. If enabled, any new SCSI device will use SpeedWrite performance enhancement by default.

Limits: enabled, disabled

Actions: **set SpeedWriteDefault [enabled |disabled]**

Information: **get SpeedWriteDefault**

SaveConfiguration

VirtualDriveResponse

Virtual Drive Response allows the FibreBridge to provide proxy responses to SCSI INQUIRY and TEST UNIT READY commands if a SCSI device is in a timeout or busy. Host systems may then assign devices consistently despite the device's state during execution of the SCSI commands.

Default: disabled

Action: **set VirtualDriveResponse [enabled | disabled]**

Information: **get VirtualDriveResponse**

4.1.5 Fibre Channel configuration commands

The Fibre Channel ports are configured with default settings but may be customized using the CLI commands in this section.

BootFibreDelay

Initialization of the Fibre Channel port is delayed by 0, 15 or 30 seconds to allow a connected Fibre switch to fully initialize before the FibreBridge announces its presence.

Limits: 0, 15 or 30 seconds — Default: 0 (no delay)

Action: **set BootFibreDelay [0|15|30]** — Information: **get BootFibreDelay**

SaveConfiguration

BootScan

Provides dynamic mapping of SCSI devices to the Fibre port/LUN combination via a SCSI bus scan at boot time. All devices discovered during the bus scans will be assigned to a Fibre port, Fibre LUN combination until the next reset/power cycle. This dynamic mapping will replace the current, static mapping of the FibreBridge.

Limits: enabled, disabled — Default: disabled

Action: set **BootScan [enabled|disabled]** — Information: **get BootScan**

SaveConfiguration

BootScanPorts

For legacy applications, selects/displays the ports to be used for a boot scan.

Action: **set BootScanPorts [fp | all | auto]** — Information: **get BootScanPorts**

SaveConfiguration

DispFcPortDB

Displays the contents of the specified FC port's internal port database which contains Fibre Channel addressing information for each FC target device visible to the FibreBridge.

Action: **none** — Information: **DispFcPortDB <fp>**

Returns: Node name, 24-bit port ID, 8-bit internal loop ID of each FC device

FcAck0

Specifies whether ACK0 or ACK1 will be returned in response to a Class 2 FC data frame or sequence. Enable sends ACK0 at the end of a sequence. Disable returns an ACK1 frame for each data frame.

Limits: enabled, disabled — Default: disabled

Actions: **set FcAck0 [enabled |disabled]** — Information: **get FcAck0**

SaveConfiguration

FcClass2

Specifies whether the FibreBridge will support Fibre Channel Class 2 (multiplexed) service.

Limits: enabled, disabled — Default: disabled (use Class 3 service)

Actions: **set FcClass2 [enabled |disabled]** — Information: **get FcClass2**

SaveConfiguration

FcConnMode

Controls/reports the connection mode the FibreBridge uses when communication across a Fibre Channel network, either to an arbitrated loop (FC-AL) when you select loop *mode, or point-to-point when you choose* ptp.

Limits: applies to all Fibre Channel ports — Default: loop

Actions: **set FcConnMode [loop | ptp]** — Information: **get FcConnMode**

SaveConfiguration

FcFairArb

Turns the Fibre Channel Arbitrated Loop (FC-AL) arbitration fairness on or off. Enabling this feature causes the FibreBridge to follow the arbitration fairness rules on the FC-AL.

Limits: applies to all Fibre Channel ports
Default: on, enabling arbitration fairness
Actions: **setFcFairArb [enabled | disabled]**
Information: **getFcFairArb**
SaveConfiguration

FcFullDuplex

FcFullDuplex enabled allows full duplex Fibre Channel communication between the FibreBridge and other Fibre Channel devices. Disable FcFullDuplex results in half duplex mode.

Limits: applies to all Fibre Channel ports
Default: enabled
Actions: **setFcFullDuplex [enabled | disabled]**
Information: **get FcFullDuplex**
SaveConfiguration

FcHard

Used to enable or disable Fibre Channel hard address assignment. Under soft addressing, the FibreBridge loop address is assigned during loop initialization. Use FcHardAddress *(described below) if you enable hard addressing.*

Limits: applies to all Fibre Channel ports
Default: enabled, or hard addressing
Actions: **setFcHard [enabled | disabled]**
Information: **get FcHard**
SaveConfiguration

FcHardAddress

Sets/displays the value used as the FC-AL hard address. This hexadecimal value represents the address the FibreBridge will try to use if hard addressing is enabled. When an optional address is not present, the current value is displayed.

Limits: Each port has individual hard address value.
Default: 3 (Fibre port 0) 4 (port 1) 5 (port 2)
0 < = hard id < = 0x7d
Actions: **set FcHard Address [fp |[address]]**
Information: **get FcHardAddress [fp]**
SaveConfiguration
verbose return: Port n FcHardAddress = 0x01

FcInitiator

Allows FibreBridge to operate as an initiator on the Fibre Channel network, an attribute required for features such as Extended Copy.

Limits: enabled, disabled
Default: disabled
Actions: **set FcInitiator [enabled | disabled]**
Information: **get FcInitiator**
SaveConfiguration

FcPortFailure

Controls the behavior of a FC port when the FibreBridge is operating in AddressMap B. (failover) mode.

Limits: [Recover] will try to reset the FibreBridge to its pre-failover state. the recover mode must be past the index of the failed FC port
[Force] will create one of three types of simulated port failure on the specified active FC port for testing and demonstration.
[loopdown] loss of FC synchronization (pulled cable, bad GBIC, etc.)
[portdown] simulates ISP chip hardware failure as detected by a fabric
[Isperr] simulates an internal ISP chip fatal error

Actions: **FcPortFailure fp [recover| force [loopdown | portdown | isperr]]**
Information: **none**

FcPortList

Returns a list of available Fibre Channel ports and their current status.

Limits: valid status values are OK and Failed
Actions: **none**
Information: **FcPortList**
Returns: [line count] [fp] [status]

FcSCSIBusyStatus

Specifies the SCSI status value returned when the FibreBridge is unable to accept a SCSI command because of a temporary lack of resources.

Limits: [busy | qfull] Default: busy

Actions: **set FcSCSIBusyStatus [busy | qfull]** Information: **get FcSCSIBusyStatus**

SaveConfiguration

FcTargets

Obtains information about every Fibre Channel target device visible to a FibreBridge operating in initiator mode; devices may be used as targets for initiator mode features such as Extended Copy.

Actions: **none** Information: **FcTargets**

Returns: Node Name, FC LUN & inquiry data for each FC device found

FcWWName

Reports the Word Wide Name (WWN) of the Fibre Channel interface. Each FC port has an individual and unique WWN. The least significant 6 bits of the WWN are used as the Ethernet MAC address.

Limits: Fabric and loop operations are unpredictable if duplicate WWNs are assigned.

Actions: **none** Information: **get FcWWN [PortNumber]**

Return: Port n FcWWName= 20 00 00 10 86 nn nn nn

FibreBridgeTargetLUN

Specifies the soft target LUN(s) to be used by the FibreBridge when addressed by the host as a SCSI device.

Limits: Any map coinciding with the user-specified FibreBridgeTarget LUN must first be set to offline before trying to change it. This map will be destroyed upon power-cycling the FB.
Disabling a FibreBridgeTargetLUN for a particular FC port will destroy the map to the FB4500 for that port.
The get form reports all FibreBridgeTargetLUNs currently NOT disabled. Specifying a port returns the status of that port.

Action: **set FibreBridgeTargetLUN [fp] [fl] | [disabled]]** Information: **get FibreBRidgeTargetLUN <[fp]>**

SaveConfiguration

Returns:
[Line Count]
[fp] [fl]

Performance

Returns the performance data for the Fibre Channel port you specify. Data includes the average rate (MBs per sec.) and number of I/Os measured over the previous sampling period where a sampling period is approximately one second. Requesting performance data for an FC port which has been disabled or has failed will result in the display of an error message ("ERROR Disabled Fibre Channel port" or "ERROR Failed Fibre Channel port"). Reported performance may be affected by FC port and SCSI bus availability and saturation, SCSI device speeds and overall system use.

Limits: Successful SCSI Read (08h, 28h) and Write (0Ah, 2Ah) commands are considered I/Os.
Valid FC port (fp) entries are [0|1|2]

Actions: **none** Information: **get Performance <fp>**

Verbose return:
[line count]
; fp MB/s IO/s
[fp] [mmm.mmm] [nnn]

ServicesLUN

Specifies the Services LUN(s) to be used by the FibreBridge during an "inband" CLI session with a given host as taken from NVRAM..

Limits: Any map coinciding with the user-specified ServicesLUN must first be set to offline before trying to change it. This map will be unavailable upon power-cycling the FibreBridge.
The get form reports all ServicesLUNs currently NOT disabled. Specifying a port returns the status of that port.

Default:0x08

Action: **set ServicesLUN [fp] [fl] | [disabled]]** Information: **get ServicesLUN <[fp]>**

SaveConfiguration

Return:
[Line Count]
[fp] [fl]

4.1.6 Serial Port configuration commands

The ATTO FibreBridge serial ports are configured with default settings but may be customized to your specifications using the CLI commands in this section.

SerialPortBaudRate

Configures/reports the baud rate for the FibreBridge RS-232 serial port. The number of data bits per character is fixed at 8 with no parity.

Limits: 2400, 9600, 19200, 38400, 57600, 115200 — Default: 9600

Actions: **set SerialPortBaudRate [2400 | 9600 |19200 | 38400 | 57600 |115200]** — Information: **get SerialPortBaudRate**

SaveConfiguration

SerialPortEcho

Enables/disables/reports the echoing of keyboard input. When enabled, all non-control character keyboard input is output to the display.

Limits: Local ASCII terminal (or terminal emulator) echo settings should be set to disabled while using SerialPortEcho enabled — Default: enabled

Actions: **setSerialPortEcho [enabled | disabled]** — Information: **get SerialPortEcho**

SaveConfiguration Restart

SerialPortHandshake

Configures/reports the data handshaking method used to control the flow between the transmitter and receiver using hardware flow control, software flow control (Xon/Xoff)or no flow control.

Limits: hard (hardware flow control), xon (software flow control) or no flow control (none) — Default: no flow control (none)

Actions: **set SerialPortHandshake [hard | xon | none]** — Information: **getSerialPortHandshake**

SaveConfiguration

SerialPortStopBits

Configures/reports the number of stop bits per character for the FibreBridge RS -232 serial port. The number of data bits per character is fixed at 8 with no parity.

Limits: 1 or 2 — Default: 1 stop bit

Actions: **set SerialPortStopBits [1 | 2]** — Information: **get SerialPortStopBits**

SaveConfiguration

4.1.7 Ethernet configuration commands

The Ethernet configuration commands configure the Ethernet and TCP/IP parameters for FibreBridge models with Ethernet ports.

DhcpFixedDelay

Selects/displays the delay, in seconds, between DHCP client request intervals. 0 time is typical.

Limits: 0, 15 or 30 seconds	Default: 0 (no delay)
Action: **set DhcpFixedDelay [0|15|30]**	Information: **get DhcpFixedDelay**

EthernetSpeed

Sets/displays the current speed of the Ethernet connection.

Limits: [10 | 100 | Auto]	Default: auto
Actions: **set EthernetSpeed xxx.xxx.xxx.xxx**	Information: **get EthernetSpeed**
SaveConfiguration	Returns: [10 | 100 | auto ([10 | 100 | UNKNOWN])] If auto enabled, value in parentheses indicates current speed

Exit

Exits the current telnet CLI session; it has no effect if used during a serial or in-band CLI session.

Actions: **Exit**	Information: **none**

IPAddress

Sets/displays the current FibreBridge IP address.

Limits: If IPDHCP is enabled (see below), get command reports current IP address assigned by DHCP server	Default IP Address: 10.0.0.1
Actions: **set IPAddress xxx.xxx.xxx.xxx**	Information: **get IPAddress**
SaveConfiguration	

IPDHCP

Selecting DHCP allows the FibreBridge to request an IP address from the network.

Limits: The network must have at least one DHCP server	Default: disabled
Actions: **set IPDHCP [enabled | disabled]**	Information: **get IPDHCP**
SaveConfiguration	

IPGateway

Sets/displays the current gateway.

Limits: If IPDHCP is enabled (see above), get command reports current IP gateway assigned by DHCP server	Default: 00.00.00.00
Actions: **set IPGateway xxx.xxx.xxx.xxx**	Information: **get IPGateway**
SaveConfiguration	

IPSubnetMask

Sets/displays the current subnet mask.

Limits: If IPDHCP is enabled (see above), get command reports current subnet mask assigned by DHCP server	Default: 255.255.255.000
Actions: **set IPSubnetMask xxx.xxx.xxx.xxx**	Information: **get IPSubnetMask**
SaveConfiguration	

4.1.8 Mapping commands

Access to SCSI devices is via Fibre Port and Fibre LUN addresses mapped to SCSI bus, target and LUNs. CLI commands are used to modify the mapping.

The AddressMap, AutoMap and RouteXxxxx map Fibre Channel Port/LUN to SCSI bus/target/LUN. Host applications use the Fibre Port and Fibre LUN to access specific SCSI devices and set up port failover. See Chapter 3.1 and Chapter 3.1.1 for more information.

Appendix B shows the sequence of AutoMap and RouteXxxxx commands.

AddressMap

Enables port failover, the automatic substitution of the mapping from a failed port to a port reserved to take over for it.
set AddressMap A *configures the FibreBridge to enable mapping of specific devices to a specific Fibre Channel port and LUN*
set AddressMap B 1 *maps all devices to one port, leaving one port offline and one line reserved to take over in case the port fails*
set AddressMap B 2 *maps all devices across two ports, leaving the third reserved to take over in case a port fails*
set AddressMap C *shows the FibreBridge as a single Fibre Channel device with three ports to a host. All devices are available on each Fibre Channel port at the same LUN.*

Default: A

Actions: **set AddressMap [A | B [1 | 2] | C]]**
SaveConfiguration

Information**: get AddressMap**

AutoMap

Automatically maps all currently operational SCSI devices attached to the FibreBridge and distributes the devices among optional, user-specified Fibre Channel ports. Issue an FCPortList and a SCSIPortList command before issuing an AutoMap command because AutoMap will ignore devices attached to a non-operational SCSI busses and will assign devices to a non-operational Fibre Channel port if specified.

Limits: Automapping skips unavailable (offline or failed) SCSI ports; skips unavailable Fibre Channel ports unless specified.

Actions: AutoMap

BootFibreDelay

Initialization of the Fibre Channel port is delayed by 0, 15 or 30 seconds to allow a connected Fibre switch to fully initialize before the FibreBridge announces its presence.

Limits: 0, 15 or 30 seconds

Default: 0 (no delay)

Action: **set BootFibreDelay [0|15|30]**
SaveConfiguration

Information: **get BootFibreDelay**

BootScan

Provides dynamic mapping of SCSI devices to the Fibre port/LUN combination via a SCSI bus scan at boot time. All devices discovered during the bus scans will be assigned to a Fibre port, Fibre LUN combination until the next reset/power cycle. This dynamic mapping will replace the current, static mapping of the FibreBridge.

Limits: enabled, disabled

Default: disabled

Action: set **BootScan [enabled|disabled]**
SaveConfiguration

Information: **get BootScan**

BootScanPorts

*For legacy applications, selects/displays the ports to be used for a boot scan. Port failover (*AddressMap B*) will override* bootscanports

Action: **set BootScanPorts [fp | all | auto]**
SaveConfiguration

Information: **get BootScanPorts**

DispFcPortDB

Displays the contents of the specified FC port's internal port database which contains Fibre Channel addressing information for each FC target device visible to the FibreBridge.

Action: **none**

Information: **DispFcPortDB <fp>**

Returns: Node name, 24-bit port ID, 8-bit internal loop ID of each FC device

FcConnMode

Controls/reports the connection mode the FibreBridge uses when communication across a Fibre Channel network, either to an arbitrated loop (FC-AL) when you select loop *mode, or point-to-point when you choose* ptp.

Limits: applies to all Fibre Channel ports
Default: loop

Actions: **set FcConnMode [loop | ptp]**
Information: **get FcConnMode**

SaveConfiguration

FcHard

Used to enable or disable Fibre Channel hard address assignment. Under soft addressing, the FibreBridge loop address is assigned during loop initialization. Use FcHardAddress *(described below) if you enable hard addressing.*

Limits: applies to all Fibre Channel ports
Default: enabled, or hard addressing

Actions: **setFcHard [enabled | disabled]**
Information: **get FcHard**

SaveConfiguration

FcHardAddress

Sets/displays the value used as the FC-AL hard address. This hexadecimal value represents the address the FibreBridge will try to use if hard addressing is enabled. When an optional address is not present, the current value is displayed.

Limits: Each port has individual hard address value.
Default: 3 (Fibre port 0) 4 (port 1) 5 (port 2)
0 < = hard id < = 0x7d

Actions: **set FcHard Address [fp |[address]]**
Information: **get FcHardAddress [fp]**

SaveConfiguration
verbose return: Port n FcHardAddress = 0x01

FcPortFailure

Controls the behavior of a FC port when the FibreBridge is operating in AddressMap B. (failover) mode.

Limits: [Recover] will reset the FibreBridge to its pre-failover state. the recover mode must be past the index of the failed FC port
[Force] will create one of three types of simulated port failure on the specified active FC port for testing and demonstration.
[loopdown] loss of FC synchronization (pulled cable, bad GBIC, etc.)
[portdown] simulates ISP chip hardware failure as detected by a fabric
[Isperr] simulates an internal ISP chip fatal error

Actions: **set FcPortFailure fp [recover| force [loopdown | portdown | isperr]]**
Information: **none**

FcTargets

Obtains information about every Fibre Channel target device visible to a FibreBridge operating in initiator mode; devices may be used as targets for initiator mode features such as Extended Copy.

Actions: **none**
Information: **FcTargets**
Returns: Node Name, FC LUN & inquiry data for each FC device found

FibreBridgeTargetLUN

Specifies the soft target LUN(s) to be used by the FibreBridge when addressed by the host as a SCSI device.

Limits: Any map coinciding with the user-specified FibreBridgeTarget LUN must first be set to offline before trying to change it. This map will be unavailable upon power-cycling the FibreBridge.
The get form reports all FibreBridgeTargetLUNs currently NOT disabled. Specifying a port returns the status of that port.

Action: **set FibreBridgeTargetLUN [fp] [fl] | [disabled]]**
Information: **get FibreBridgeTargetLUN <[fp]>**

SaveConfiguration
Returns:
[Line Count]
[fp] [fl]

RouteChange

Maps a Fibre Channel port and LUN to a SCSI bus, target and LUN. A port being used as a failover port in AddressMap B mode may not be modified.

Limits: Attempts to map to a SCSI device currently online results in an error message
Valid entries: fp (0-2), fl (0-31), sb (0-3), st (0-15), sl (0-7)

Action: **RouteChange [fp] [fl] [sb] [st] [sl]**
Information: **none**

RouteDisplay

Returns a list of currently mapped Fibre Channel-to-SCSI routes sorted by Fibre Channel address and assembled according to the optional parameters specified. Each list is preceded by a count of the lines that immediately follow.

Valid status values are: Online, Offline, Unavailable, Available, Mapped, Unmapped, FibreBridge, and All.

Action: **none**

Information:
RouteDisplay Displays all current maps
RouteDisplay [fp] Displays specified FC port maps
RouteDisplay [status] Displays all maps with route status [online|offline]
RouteDisplay [fp [fl]] Displays the current map of fp & fl
RouteDisplay [fp [status]] Displays all maps for a given FC port with route status [online|offline]

Returns:
[line count]
[fp] [fl] [sb] [st] [sl] [Online|Offline|Unavailable|Available|Unmapped|FibreBridge|ALL]

RouteOffline

Sets a route to offline or reports its status as offline or going offline. A port being used as a failover port in AddressMap B mode may not be modified.

Action: **set RouteOffline [fp] [fl]**

Information: **get RouteOffline [fp]**

Returns: [fp] [fl] [sb] [st] [sl] [Going offline|Offline]

RouteOnline

Sets a route to online or reports its status. A port being used as a failover port in AddressMap B mode may not be modified.

Limits: if route is not currently mapped, command results in an error message

Action: **set RouteOnline [fp] [fl]**

Information: **get RouteOnline [fp]**

Returns: [fp] [fl] [sb] [st] [sl] [Online|Offline]

ScsiTargets

Returns a list of SCSI devices operational on the referenced SCSI port.

Action: **none**

Information: **ScsiTargets [sb]**

Returns: [line count]
[sb] [st] [sl] [device type] [vendor ID] [product ID] [revision] [serial number]

ServicesLUN

Specifies the Services LUN(s) to be used by the FibreBridge during an "inband" CLI session with a given host as taken from NVRAM..

Limits: Any map coinciding with the user-specified ServicesLUN must first be set to offline before trying to change it. This map will be unavailable upon power-cycling the FibreBridge.
The get form reports all ServicesLUNs currently NOT disabled. Specifying a port returns the status of that port.

Default: 8 (all FC ports)

Action: **set ServicesLUN [fp] [fl] | [disabled]]**

Information: **get ServicesLUN <[fp]>**

SaveConfiguration

Return:
[Line Count]
[fp] [fl]

4.2 FibreBridge menu text-based CLI interface

Configuration of many models of the ATTO FibreBridge is available via a menu which contains most commands available through CLI but in a hierarchical user-friendly format. It follows a standard menu/choice model.

Configuration of the FibreBridge includes displaying and modifying various attributes of FibreBridge operation, as well as the update of firmware. For many FibreBridge models (see Chapter 2), the menu system provides access to ATTO FibreBridge services in a standard menu/choice model, and displays options and current status.

Accessing the menu

1. **Communicate with the FibreBridge through the RS-232 port or Telnet over Ethernet.**
2. **The Command Line Interface mode is available after the initial display is complete, ending with the word *Ready*.**
3. **Type *Menu* to enter the menu system.**

Conventions

Ellipses (...) show that a choice will lead to another menu. For example, if you choose a) on the FibreBridge Main Menu, you will see another menu, FibreBridge Configuration Menu. If you choose b) Fibre Channel Configuration, you will see a different menu, Fibre Channel Configuration Menu (see examples at right).

Brackets after a menu item show current settings. If you choose a) on the FibreBridge Configuration Menu (one level beyond the Main Menu) (see examples at right) you will see

FibreBridge Name [ ].

No ellipses follow: this is the last choice. If you wish to change the [ ], you type in your response to

Enter FibreBridge Name (Max of 8 characters)

In the FibreChannel Configuration Menu, choosing Port Connection Mode (loop) presents you with the following:

This option determines the port type to which the FibreBridge will attempt to login. Loop Mode allows Arbitrated Loop (FC_AL) logins via an FL_Port. Point-to-Point Mode (ptp) allows connection to a fabric port (F_Port).
Type the letter of your choice and press 'Enter'.
Connection Mode: a) Loop, b) Point-to-Point:"

Typing "a" will enable loop mode, typing "b" will enable point-to-point mode.

Examples

```
FibreBridge Main Menu
---------------------------------
a) FibreBridge Configuration...
b) FibreBridge Maintenance...
c) FibreBridge Diagnostics...
d) Save / Restore Configuration....
x) Exit Menu Mode
Enter a-d or x:

*** Choice a) ***
FibreBridge Configuration Menu
-----------------------------------------------
a) FibreBridge Name [                ]
b) Fibre Channel Configuration...
c) SCSI Port Configuration...
d) Routing Configuration...
e) Serial (RS-232) Port Configuration...
f) Network Configuration...
x) Return to previous menu...
Enter a-f or x:

*** Choice b) ***
Fibre Channel Configuration Menu
-----------------------------------
a) Port Connection Mode [loop]
b) FC-AL Arbitration Fairness [enabled]
c) Fibre Channel Frame Length [2048]
d) Full Duplex Mode [enabled]
e) List Fibre Channel Ports
f)  Unprocessed SCSI Command Returns [busy]
g) FC-AL Hard Addressing Mode [disabled]
h) Fibre Channel Class 2 service [disabled]
i)  Fibre Channel ACK0 acknowledgements
[disabled]
j)  Fibre Channel Initiator Mode [enabled]
k) Fibre Channel Port 0 Configuration...
l)  Fibre Channel Port 1 Configuration...
m) Fibre Channel Port 2 Configuration...
x) Return to previous menu...
Enter a-m or x:
```

4.3 ATTO BridgeTools provides graphical interface

The simplest way to communicate with the ATTO FibreBridge is to use ATTO BridgeTools, a Java-based graphical interface configuration utility designed to flash firmware and manage the configuration for all models of the FibreBridge.

Configuration of the FibreBridge includes displaying and modifying various attributes of FibreBridge operation, as well as the update of firmware. BridgeTools detects which FibreBridge model is available and presents you with the applicable configuration options.

The ATTO BridgeTools program currently supports Sun Solaris 8, MAC OS 10.1 and Windows 95/98/ME, NT and 2000.

Communicate with the FibreBridge either through in-band SCSI over Fibre Channel, the RS-232 port or Telnet or FTP over Ethernet.

Select in-band connection direct over the Fibre Channel link, RS-232 port or Ethernet port.

A tabbed panel interface presents configuration parameters in a simple, one-window display. Message boxes, icons, drop-down boxes, menu bars and other common graphical constructs will lead you through the configuration process.

The ATTO BridgeTools Manual has complete instructions on how to install and operate the program.

4.4 In-band CLI uses SCSI over Fibre port

In-band Command Line Interface (CLI) configures and manages the ATTO FibreBridge using SCSI-based CLI commands over a Fibre port connection.

In-band CLI allows a programmer to configure the FibreBridge while it is moving data. Using a programmer's interface, ATTO FibreBridge Services CLI commands as described previously in this manual may be implemented. The only command not available is *menu.*

In-band CLI is implemented as a device separate from the FibreBridge itself. It uses a different LUN than the FibreBridge, and reports as a Storage Enclosure Services (SES) device (device type 0x0D). This LUN is referred to as the ServicesLUN

The ServicesLUN is visible on all Fibre ports but is actually a single unit. The default value for each Fibre port's ServicesLUN is 0x08.

The ServicesLUN must be reserved for each Write Buffer/Read Buffer pair, using the SCSI Reserve command to insure integrity of the in-band CLI session.

1 **An initiator (host) sends a SCSI Reserve command to the ServicesLUN.**

   ➔ If the ServicesLUN is not reserved by another initiator, the ServicesLUN is now reserved and ready to begin a new CLI session.

   ➔ If the FibreBridge configuration is reserved by a different CLI session (i.e. serial or Telnet), the in-band session will not be allowed to modify the FibreBridge configuration. If you try, the results buffer of the ServicesLUN will return:

   ```
   Process X has the configuration reserved.
   ID of this session = Y
   Ready.
   ```

2 **The initiator issues a SCSI Write Buffer command to the ServicesLUN. A Write Buffer command must be accompanied by an ASCII buffer representing the CLI command string such as**

   ```
   set FibreBridgeName FB4500
   ```

3 **The ServicesLUN will execute the command line and create feedback in the form of ASCII characters into a buffer. This buffer is 8 KB and circular. Retrieve the results by issuing a Read Buffer command before issuing another Write Buffer command.**

4 **A subsequent Write Buffer command will execute the new command line and overwrite the previous results in the buffer with new results.**

5 **The ServicesLUN can be released by issuing a SCSI Release command to the Services LUN after each Write/Read Buffer pair, or multiple Write/Read Buffer pairs.**

Initiator (Host)	FibreBridge
Reserve ServicesLUN	return: "ok"
Write Buffer ServicesLUN bid 0 "get Temperature"	executes the CLI command, stores output in buffer
Read Buffer ServicesLUN bid 0	return: "Temperature=28C\r\n\Ready.\r\n\0"
Release ServicesLUN	return: "ok"

I/O details

The buffer sent to the Services LUN during the data out phase of a Write Buffer command must be:

➔ ASCII data

➔ maximum 80 bytes length

➔ terminated with either a carriage return character (0x0D), line feed character (0x0A) or NULL character (0x00)

➔ Characters following the first carriage return character, line feed character or NULL character are ignored.

The buffer retrieved from the Services LUN during the data-in phase of a Read Buffer command will be:

- ➔ ASCII data
- ➔ 8 KBytes (8192 bytes) in length
- ➔ terminated with a NULL character (0x00)
- ➔ Characters following the NULL character are meaningless.

A CHECK_CONDITION, INVALID_PARAMETER _IN_CDB will be returned to an initiator that specifies an incorrect Buffer ID, Mode, Length or Buffer Offset. The Mode is always Data (0x2), the Buffer ID is always 0 and the Buffer Offset is always 0.

Exhibit 4.4-1 The SCSI command process: reserve the FibreBridge, send the command, release the FibreBridge.

Initiator/Host		**FibreBridge**
Goal: reserve the FibreBridge for an in-band CLI command		
SCSI cdb: Reserve ServicesLUN	=>	
	<=	SCSI success
Goal: retrieve the FibreBridge temperature via in-band CLI		
1. Issue the command:		
SCSI cdb: WriteBuffer ServicesLUN, bid=0, “get Temperature\n”	=>	places “Temperature=28C\n\r” into the read-data buffer
	<=	SCSI success
2. Retrieve the results:		
SCSI cdb: ReadBuffer ServicesLUN, bid=0	=>	
	<=	Returns “Temperature=28C\n\r” from the read-data buffer
	<=	SCSI success
Goal: release the FibreBridge for other in-band users		
SCSI cdb: Release ServicesLUN	=>	
	<=	SCSI success

5 Enhancing performance

SpeedWrite is a method to improve the performance of WRITE commands to SCSI devices attached to the FibreBridge 4500 enabled by CLI commands.

SpeedWrite is a method to improve the performance of FCP WRITE commands to SCSI devices attached to the FibreBridge. Using the CLI command SpeedWrite, you can specify the SCSI bus, target and LUN of a mapped device or specify [all] to set or get the state of all currently mapped SCSI devices.

SpeedWriteDefault specifies the state of SpeedWrite for any SCSI devices mapped manually or via an AutoMap operation. If enabled, any new SCSI device will use SpeedWrite performance enhancement by default.

6 Updating firmware

The ATTO FibreBridge has several processors which control the flow of data. The firmware to control these processors can easily be upgraded in the field using the WriteBuffer *command over the in-band Fibre Channel connection,* PUT *command from an FTP connection, or* ZModem *utility over an RS-232 serial connection.*

The FibreBridge firmware is distributed as a compressed .JAR file and can be obtained from the ATTO Technology, Inc. web site at www.attotech.com. The firmware is updated

To use FTP over Ethernet to flash new firmware into the FibreBridge:

1 **Uncompress the.JAR file obtained from the ATTO Technology Inc. website (www.attotech.com) into an image file (.IMA).**

Note: the .JAR file can be uncompressed using any utility that supports the "zip" format.

2 **Establish an FTP link to the bridge that is to be flashed.**

3 **Use the** PUT **command to download the firmware. For example:**

$ PUT c:\bridge_firmware\FB3200100.IMA

4 **Once the download is complete, cycle power on the FibreBridge to implement the new firmware.**

To use the ZModem command over the RS-232 serial link to load new firmware:

1 **Uncompress the.JAR file obtained from the ATTO Technology Inc. website (www.attotech.com) into an image file (.IMA).**

Note: the .JAR file can be uncompressed using any utility that supports the "zip" format.

2 **Load a Terminal Program such as Hyper Terminal.**

3 **Set the terminal and the FibreBridge for the highest possible baud rate for your terminal. Default parameters are: 9600 baud, N, 8, 1 no handshaking and ASCII Terminal.**

4 **Turn on power to the FibreBridge.**

5 **Once the Ready prompt appears, type** ZMODEM RECEIVE**. The FibreBridge will display that it is preparing to receive a file from your terminal program.**

6 **On the terminal program, choose** Transfer Send File

7 **In the Send File Box, enter the current FibreBridge .ima file or click the browse button to find it**

8 **Click** Send File

9 **The FibreBridge should acknowledge receiving the file and display a message not to interrupt power for 90 seconds. Do not interrupt the flash process. Do not power down the host or the FibreBridge until the display returns the *Ready* prompt. Interrupting the flash process will make your FibreBridge inoperable and you will have to return it to ATTO Technology for repair.**

WARNING Do not interrupt the flash process. Do not power down the host or the FibreBridge until the display returns the *Ready* prompt. Interrupting the flash process will make your FibreBridge inoperable and you will have to return it to ATTO Technology for repair.

10 **Once the download is complete, cycle power on the FibreBridge to invoke the new firmware.**

7 Serverless backup support

Serverless Backup is an application that allows data to be copied between two storage devices (Fibre Channel disks, SCSI disks and SCSI tapes) with minimal intervention from a server.

As the volume of data on a network grows, the resources required to back up this data also grow. Data protection requires that large volumes of data be copied from on-line storage devices to dedicated archive devices. This places a very heavy load on the host processors, I/O busses, memory busses, and front-end network, thus reducing the servers ability to "serve" its clients, as well as a general reduction in performance.

Serverless Backup uses the Extended Copy command compliant with T10/99-143rl to allow a "copy manager" (the FibreBridge) to execute all of the read and write operations necessary to move data. Blocks of data are moved directly from the Fibre Channel storage through the bridge to SCSI tape or from SCSI storage through the bridge to the SCSI tape, all at Fibre Channel and SCSI speeds (as compared to moving data across the Ethernet network).

The ATTO FibreBridge will execute Extended Copy commands to and from SCSI tape drives connected directly to the FibreBridge. The hard drives you are backing up or restoring to can be anywhere on the Storage Area Network, including SCSI drives attached to the bridge. The Extended Copy command contains target and segment descriptors used to define which data is to be moved between which devices.

Target Descriptors allow the host to describe the devices involved in the Extended Copy. To be compatible with all copy agent application packages, the FibreBridge implementation supports World Wide Name, N_Port ID, and WWN plus N_Port ID descriptor types.

Segment Descriptors describe the data to copy and how much of it to copy. The two most common types of Segment Descriptors are "block (disk) to stream (tape)" and "stream (tape) to block (drive)". The FibreBridge also supports "block to block," "inline to stream," and "stream to discard.".

The FibreBridge will support copying up to 830 MB of data in a single Extended Copy command. Larger files must be backed up or restored using additional operations. The bridge can support up to eight simultaneous Extended Copy commands.

Please check the ATTO Technology, Inc. web site at www.attotech.com for a complete list of all of the applications supported as well as detailed installation and configuration tips.

How serverless backup works

1. **A copy agent on the server provides a user interface to begin a backup or restore operation as well as manage and synchronize the movement of data sets. This copy agent is either included or available as an add-on with many high-end tape backup software applications on the market.**
2. **The server sends a single Extended Copy command to the FibreBridge or to a SCSI device beyond the bridge.**
3. **The bridge interprets the segment descriptors and issues read commands to the appropriate devices.**
4. **Once enough data is read, the bridge will issue write commands to the appropriate device.**
5. **Once all of the segment descriptors have been executed, the bridge will send status to the copy agent running in the server. The data never passes through the server, thus freeing the CPU and Memory to process other requests.**

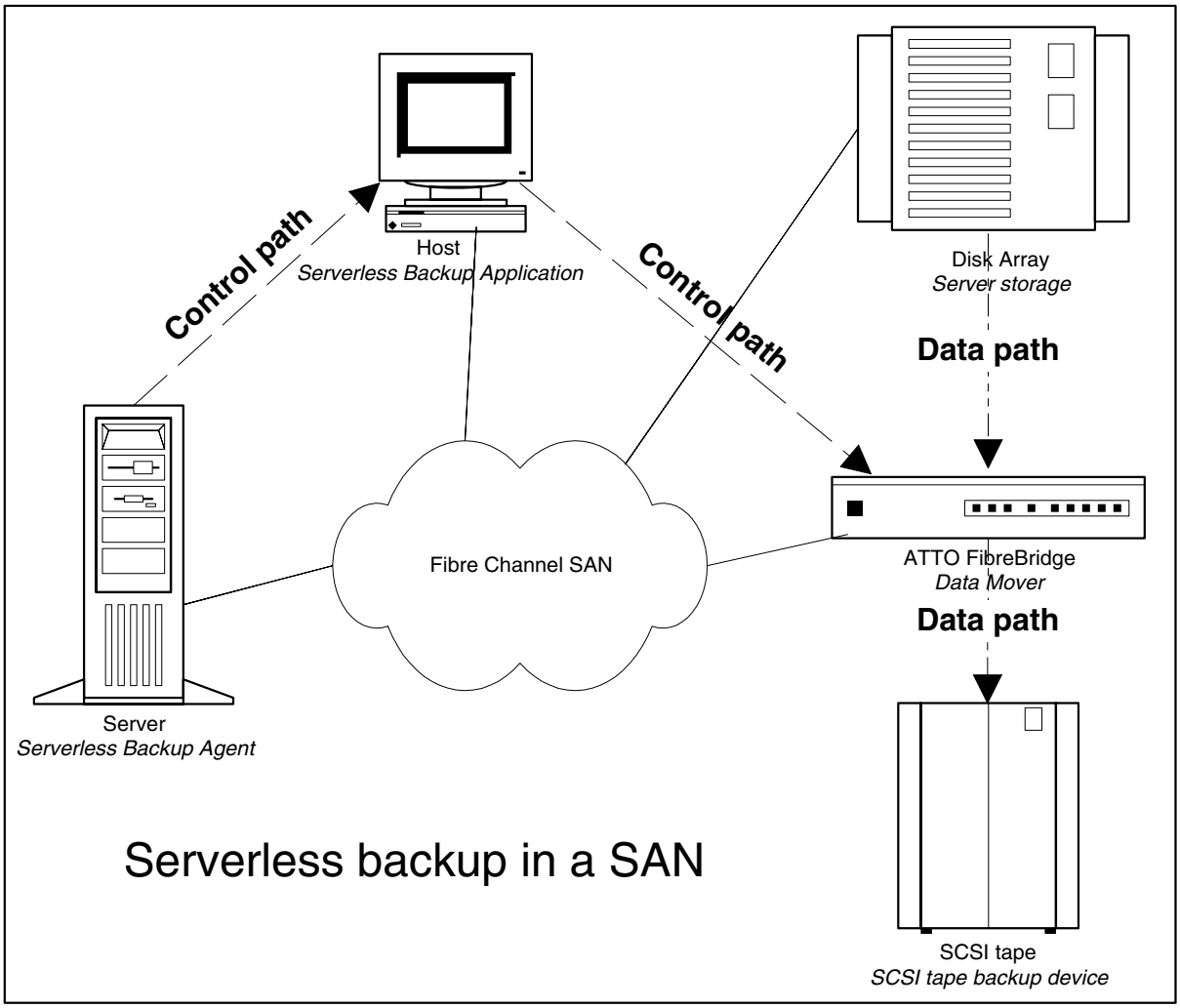
To enable serverless backup:

1. **Access the FibreBridge either through RS-232 or Ethernet.**
2. **After the** *Ready* **prompt, type** *set Fcinitiator enabled***.**
3. **At the next** *Ready* **prompt, type** *saveconfiguration restart***.**
4. **The FibreBridge is now ready to perform serverless backup.**

To monitor the progress of serverless backup operations,

1. **Access the FibreBridge through RS-232 or Ethernet.**
2. **Type** get XCStatus **to determine the status of Extended Copy commands. The return will present the** CmdNumber **field, a unique identifier for a particular Extended Copy command.**
3. **Type** get XCDevices [CmdNumber] **to find out which devices are used in a particular Extended Copy command as specified by the CmdNumber.**
4. **Type** get XCError [CmdNumber] **to retrieve any SCSI sense data returned by an Extended Copy command because of an error as specified by the CmdNumber.**

Exhibit 7-1 Once the server sends a command to the FibreBridge for extended copy, the FibreBridge manages the backup procedure, by-passing the server.



Index: Command Line Interface

A summary of the Command Line Interface commands, their defaults, an example of how they might be used, and where you can find the specifics of the command. Commands which have no default values associated with them have a blank entry in that column of the table.

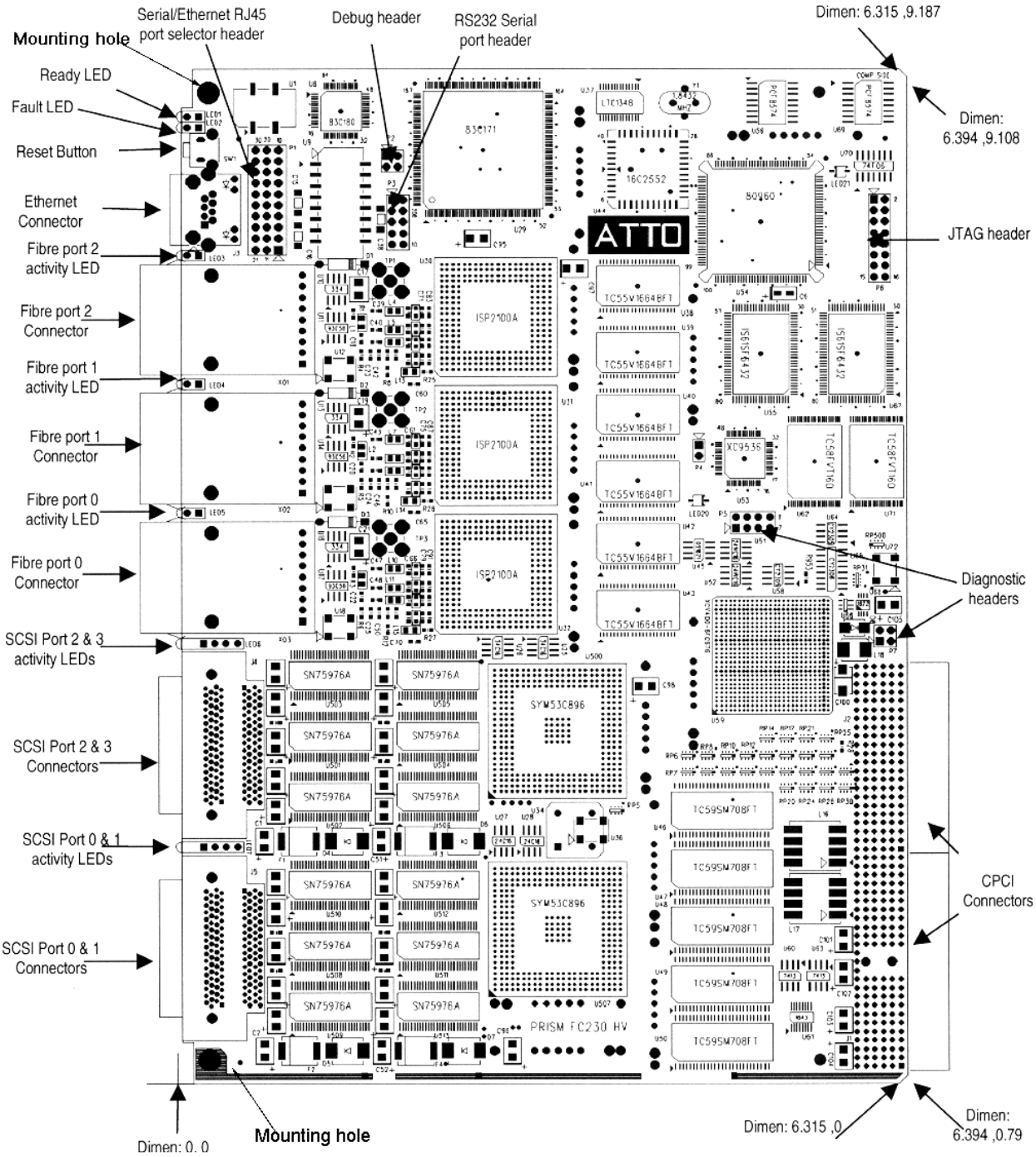
Command	Defaults	Example	Page
AddressMap	A	set addressmap B 2	36
AutoMap		automap	36
BootFibreDelay	0	set bootfibredelay 15	31, 36
BootScan	Disabled	set bootscan enabled	31, 36
BootScanPorts	Auto	set bootscanports all	31, 36
ClearEvent		clearevent	23
DhcpFixedDelay	0	set dhcpfixeddelay 15	35
DispEvent	0x00 0x00 ngood	set dispevent 0x01 0x01 all	23
DispFCPortDB		dispfcportdb 1	31, 36
DisplayEvent		displayevent	23
EccLog		get ecclog	23
ErrorLog		set errorlog clear	24
EthernetSpeed	Auto	set ethernetspeed 100	35
Exit		exit	35
FcAck0	Disabled	set fcack0 enabled	31
FcClass2	Disabled	set fcclass2 enabled	31
FcConnMode	loop	get fcconnmode	31, 37
FcFairArb	Enabled	get fcfairarb	32
FcFullDuplex	Enabled	set fcfullduplex disabled	32
FcHard	Disabled	get fchard	32, 37
FcHardAddress	FC Port 0 0x03 FC Port 1 0x04 FC Port 2 0x05	get fchardaddress 0	32, 37
FcInitiator	Disabled	get fcinitiator	32
FcPortFailure		set fcportfailure 1 recover	32, 37
FcPortList		fcportlist	32
FcSCSIBusyStatus	Busy	get fcscsibusystatus	33
FcTargets		fctargets	33
FcWWName		get fcwwname 0	33
FibreBridgeModel		get fibrebridgemodel	24
FibreBridgeName	“ ”	set fibrebridgename Omega6	24
FibreBridgeTargetLUN	7 (all FC ports)	set fibrebridgetargetlun 0 1	37
FirmwareRestart		firmwarerestart	27
FixedLengthReqSense	disabled	set fixedlengthreqsense enabled	27
Help		help driveinfo	24
IdentifyFibreBridge	Disabled	set identifyfibrebridge enabled	24
Info		info	25
IPAddress	10.0.0.1	get ipaddress	35

Command	Defaults	Example	Page
IPDHCP	Disabled	set ipdhcp enabled	35
IPGateway	00.00.00.00	set ipgateway 200.10.22.3	35
IPSubnetMask	255.255.255.0	set ipsubnetmask 255.255.255.0	35
IsReserved		isreserved	27
LogEvent	Disabled	set logevent enabled 0x04 0x0 nogood	25
MaxEnclTempAlrm	70º C	get maxencltemptalrm	27
Menu	Disabled	menu	22
MinEnclTempAlrm	0º C	set minencltempalrm 10	27
ParityLog		set paritylog clear	25
Performance		get performance 1	25
POSTOutput		get postoutput	26
Reserve		reserve disabled	27
RestoreConfiguration		restoreconfiguration default	22
RouteChange		routechange 0 25 2 15 3	37
RouteDisplay		routedisplay 0 1	38
RouteOffline		set routeoffline 0 1	38
RouteOnline		set routeonline 0 1	38
SaveConfiguration		saveconfiguration restart	22
ScsiInitID	0x07 (all SCSI busses)	set scsiinitid 0 1	29
ScsiPortBusSpeed	Ultra 2	set scsiportbusspeed 0 fast	29
ScsiPortList		scsiportlist	29
ScsiPortReset		scsiportreset 1	27
ScsiPortResetOnStartup	Enabled	set scsiportresetonstartup 2 disabled	29
ScsiPortSelTimeout	256ms	set scsiportseltimeout 2 128	29
ScsiPortSyncTransfer	Enabled	set scsiportsynctransfer 0 disabled	29
ScsiPortTaggedQueuing	Disabled	set scsiporttaggedqueuing 2 enabled	29
ScsiPortWideTransfer	Enabled	get scsiportwidetransfer 2	30
ScsiTargets		scsitargets 0	30
ScsiTermination	Enabled	set scsitermination 0 disabled	30
SerialNumber	FB4500Xxxxxxx	get serialnumber	22
SerialPortBaudRate	9600 baud	set serialportbaudrate 19200	34
SerialPortEcho	Disabled	get seriallportecho	34
SerialPortHandshake	None	set serialporthandshake xon	34
SerialPortStopBits	1	get serialportstopbits	34
ServicesLUN	8 (all FC ports)	set serviceslun 0 1 disabled	38
SpeedWrite		set speedwrite all enabled	28
SpeedWriteDefault	Disabled	set speedwritedefault enabled	28
Temperature		get temperature	26
VerboseMode	Enabled	set verbosemode disabled	22
VirtualDriveResponse	Disabled	set virtualdriveresponse enabled	30
XCDevices		get xcdevices	39
XCError		get xcerror	39
XCStatus		get xcstatus	26
Zmodem		zmodem receive	28

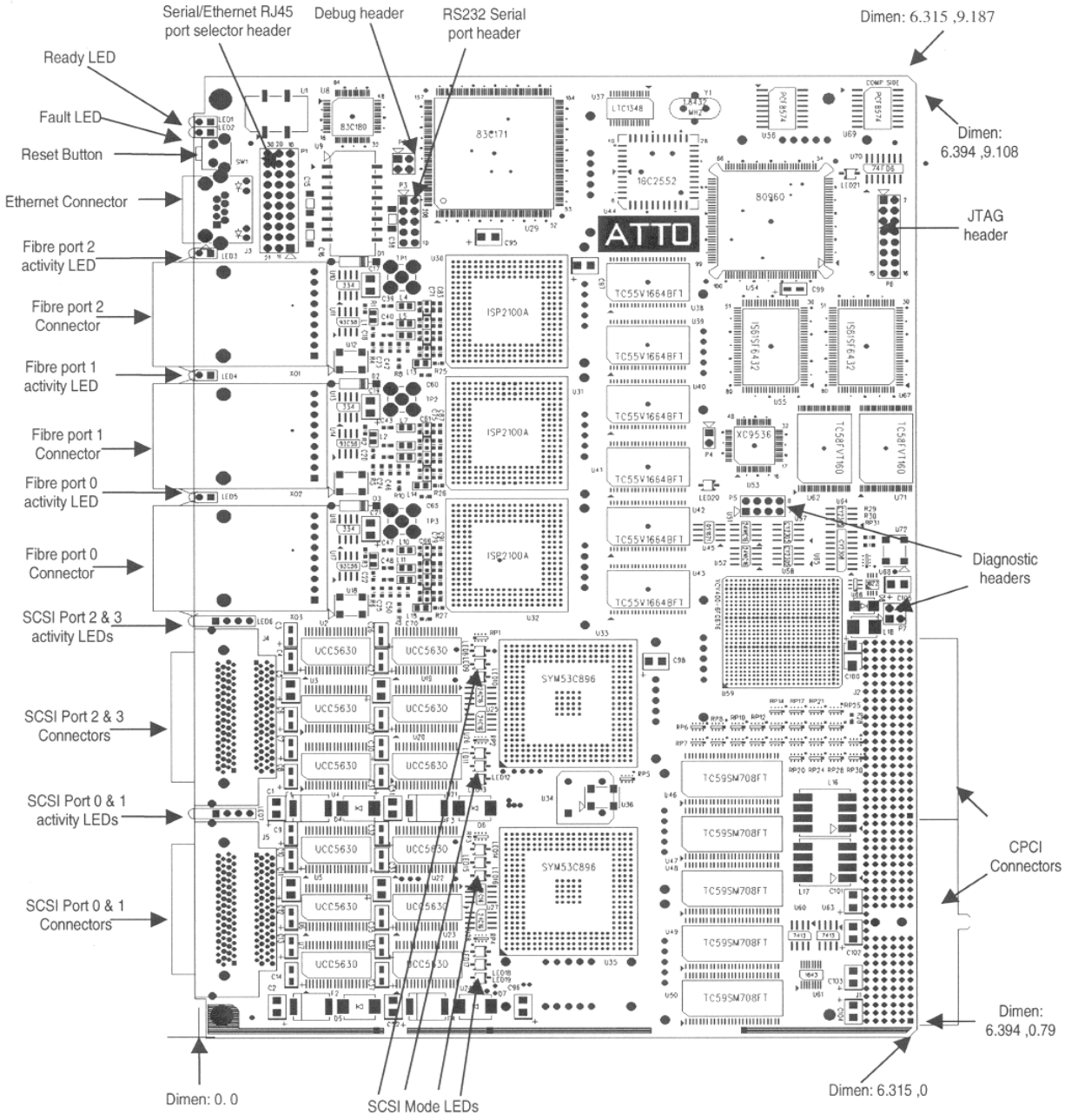
Appendix A Board layouts

The FibreBridge 4500R/D/C is available in HVD or LVD configurations.

ATTO FibreBridge™ 4500 HVD board layout



ATTO FibreBridge™ 4500 LVD board layout



Appendix B Examples of command usage

RouteXxxxx commands

The RouteXxxxx commands are: AutoMap, RouteChange, RouteDisplay, RouteOffline, RouteOnline. (See Chapter 4.1.8 and Chapter 3.1.1 for more explanation).

Following are samples of the RouteXxxxx command interaction showing actual commands and their output to the Services port.

```
Ready.
ScsiPortList
 5
;SCSI Port    Port Status
  0           O.K.
  1           Disabled
  2           O.K.
  3           Failed

Ready.
FcPortList
 4
;Fibre Port   Port Status
  0           O.K.
Failed
O.K.

Ready.
set RouteOffline 0 3

Ready.
get RouteOffline 0 3
;fp fl sb st sl On/Offline
  0  3  3  0  0 Offline

Ready.
RouteChange 0 3 3 0 0

Ready.
set RouteOnline 0 3

Ready.
get RouteOnline 0 3
;fp fl sb st sl On/Offline
  0  3  3  0  0 Online

Ready.
RouteDisplay 0 3
6
;fp fl sb st sl On/Offline
  0  3  3  0  0 Online
 xx xx  0  7  0 Reserved
 xx xx  1  7  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved

Ready.
RouteDisplay 0 online
10
;fp fl sb st sl On/Offline
  0  0  0  3  0 Online
  0  1  0  3  1 Online
  0  2  2  0  0 Online
  0  3  3  0  0 Online
  0  4 xx xx xx 4500
 xx xx  0  7  0 Reserved
 xx xx  1  7  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved

Ready.
RouteDisplay online
 18
;fp fl sb st sl On/Offline
  0  0  0  3  0 Online
  0  1  0  3  1 Online
  0  2  2  0  0 Online
  0  3  3  0  0 Online
  0  4 xx xx xx 4500
  1  0  0  1  0 Online
  1  1  1  1  0 Online
  1  2  2  1  0 Online
  1  3  3  1  0 Online
  2  0  0  2  0 Online
  2  1  1  2  0 Online
  2  2  2  2  0 Online
  2  3  3  2  0 Online
 xx xx  0  7  0 Reserved
 xx xx  1  7  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved

Ready.
RouteDisplay 0
 32
;fp fl sb st sl On/Offline
  0  0  0  3  0 Online
```

```
  0  1  0  3  1 Online
  0  2  2  0  0 Online
  0  3  3  0  0 Online
  0  4 xx xx xx 4500
  0  5 xx xx xx Offline
  0  6 xx xx xx Offline
..
  0 30 xx xx xx Offline
  0 31 xx xx xx Offline
 xx xx  0  7  0 Reserved
 xx xx  1  7  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved

Ready.
RouteDisplay
 96
;fp fl sb st sl On/Offline
  0  0  0  3  0 Online
  0  1  0  3  1 Online
  0  2  2  0  0 Online
  0  3  3  0  0 Online
  0  4 xx xx xx 4500
  0  5 xx xx xx Offline
  0  6 xx xx xx Offline
..
  0 30 xx xx xx Offline
  0 31 xx xx xx Offline
  1  0  0  1  0 Online
  1  1  1  1  0 Online
  1  2  2  1  0 Online
  1  3  3  1  0 Online
  1  4 xx xx xx Offline
  1  5 xx xx xx Offline
..
  1 30 xx xx xx Offline
  1 31 xx xx xx Offline
  2  0  0  2  0 Online
  2  1  1  2  0 Online
  2  2  2  2  0 Online
  2  3  3  2  0 Online
  2  4 xx xx xx Offline
  2  5 xx xx xx Offline
..
  2 30 xx xx xx Offline
  2 31 xx xx xx Offline
 xx xx  0  7  0 Reserved
 xx xx  1  7  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved

Ready.
```

```
set RouteOffline 0 0

Ready.
get RouteOffline 0 0
;fp fl sb st sl On/Offline
  0  0  0  3  0 Offline

Ready.
set FibreBridgeTargetLUN 0 0

Ready.
get RouteOnline 0 0
;fp fl sb st sl On/Offline
  0  0 xx xx xx 4500

Ready.
get FibreBridgeTargetLUN 0
  2
;fp fl
  0  0

Ready.
set RouteOffline 1 1

Ready.
get RouteOffline 1 1
;fp fl sb st sl On/Offline
  1  1  1  1  0 Offline

Ready.
set ScsiInitId 1 0

Ready.
get ScsiInitId 1
Port 1 ScsiInitId = 0

Ready.
RouteDisplay 1 1
6
;fp fl sb st sl On/Offline
  1  1 xx xx xx Offline
 xx xx  0  7  0 Reserved
 xx xx  1  0  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved
```

AutoMap Command Sequences

The following are examples of typical command sequences used in issuing an AutoMap command. Both the actual commands as well as their output to the Services port are shown.

```
Ready.
ScsiPortList
 5
;SCSI Port    Port Status
  0           O.K.
  1           O.K.
  2           O.K.
  3           O.K.

Ready.
FcPortList
 4
;Fibre Port   Port Status
  0           O.K.
O.K.
O.K.

Ready.
RouteDisplay online
 15
;fp fl sb st sl On/Offline
  0  0  0  0  0 Online
  0  1  1  4  0 Online
  0  2  2  2  0 Online
  0  7 xx xx xx 4500
  1  0  3  4  0 Online
  1  1  0  2  0 Online
  1  2  1  5  0 Online
  2  0  2  3  0 Online
  2  1  3  5  0 Online
  2  2  0  3  0 Online
 xx xx  0  7  0 Reserved
 xx xx  1  7  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved

Ready.
AutoMap
Setting device offline: FC 0 Lun  0.
Setting device offline: FC 0 Lun  1.
Setting device offline: FC 0 Lun  2.
Setting device offline: FC 0 Lun  7.
Setting device offline: FC 1 Lun  0.
Setting device offline: FC 1 Lun  1.
Setting device offline: FC 1 Lun  2.
Setting device offline: FC 2 Lun  0.
Setting device offline: FC 2 Lun  1.
Setting device offline: FC 2 Lun  2.
Scanning SCSI bus 0
Scanning SCSI bus 1
Scanning SCSI bus 2
Scanning SCSI bus 3
SCSI bus 1 scan complete.
SCSI bus 2 scan complete.
SCSI bus 3 scan complete.
SCSI bus 0 scan complete.

Ready.
RouteDisplay online
 17
;fp fl sb st sl On/Offline
0  0  0  0  0 Online
0  1  0  2  0 Online
0  2  0  3  0 Online
0  3 xx xx xx 4500
1  0  1  4  0 Online
1  1  1  5  0 Online
2  2  2  0 Online
1  3 xx xx xx 4500
2  0  2  3  0 Online
2  1  3  4  0 Online
2  3  5  0 Online
2  3 xx xx xx 4500
 xx xx  0  7  0 Reserved
 xx xx  1  7  0 Reserved
 xx xx  2  7  0 Reserved
 xx xx  3  7  0 Reserved
...
Ready.
ScsiPortList
 5
;SCSI Port    Port Status
  0           O.K.
  1           Failed
  2           O.K.
  3           Disabled

Ready.
FcPortList
 4
;Fibre Port   Port Status
0  O.K.
1           Failed
2           O.K.
```

Appendix B

Appendix C Standards and compliances

The ATTO Technology FibreBridge 4500 described in this manual generates and uses radio frequency energy. If this equipment is not used in strict accordance with the manufacturer's instruction, it can and may cause interference with radio and television reception. See the Technical Specification sheet for a full list of certifications.

UL 1950 3rd Edition

FCC Standards: Radio and Television Interference

WARNING The ATTO FibreBridge 4500 generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide a reasonable protection against such interference when operating in a commercial environment. Operation of this FibreBridge in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

If this FibreBridge does cause interference to radio and television reception, which can be determined by turning the equipment off and on, try to correct the interference by one or more of the following measures:

- ➔ Move the receiving antenna.
- ➔ Relocate the bridge with respect to the receiver, or move the bridge away from the receiver.
- ➔ Plug the computer into a different outlet so the computer and receiver are on different branch circuits.
- ➔ If necessary, consult an ATTO authorized dealer, ATTO Technical Support Staff, or an experienced radio/television technician for additional suggestions.

The booklet *How to Identify and Resolve Radio/TV Interference Problems* prepared by the Federal Communications Commission is a helpful guide. It is available from the US Government printing office, Washington, DC 20402, Stock No. 004-000-00345-4.

Canadian Standards

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

European Standards

Declaration of Conformity

This following statement applies to the ATTO FibreBridge.
This device has been tested in the basic operating configuration and found to be compliant with the following European Union standards:

Application of Council Directive: 89/336/EEC
Standard(s) to which conformity is declared: EN55022, EN50082-1
This Declaration will only be valid when this product is used in conjunction with other CE approved devices and when the entire system is tested to the applicable CE standards and found to be compliant

Appendix D Fibre Channel accessories

The following Fibre Channel accessories are available through ATTO Technology. Contact an ATTO Technology authorized sales representative to order.

Embedded

FibreBridge 1180

FCBR-1180-ELC Fibre Channel to LVD Ultra2 SCSI Bridge Embedded Board with Copper DB9

FCBR-1180-ELS Fibre Channel to LVD Ultra2 SCSI Bridge Embedded Board with Optical SC

FibreBridge 1190

FCBR-1190-ELC Fibre Channel to LVD Ultra2 SCSI Bridge Embedded Board with Copper DB9

FCBR-1190-ELS Fibre Channel to LVD Ultra2 SCSI Bridge Embedded Board with Optical SC

FibreBridge 1290

FCBR-1290-EL0 2-Gigabit Fibre Channel to LVD Ultra3 SCSI Bridge Embedded Board with SFP

FibreBridge 3300

FCBR-3300-EL0 2-Gigabit Fibre Channel to LVD Ultra SCSI Bridge Embedded Board

FibreBridge 4500

FCBR-4500-CH0 Fibre Channel to HVD Ultra SCSI Bridge CPCI Board

FCBR-4500-CL0 Fibre Channel to LVD Ultra2 SCSI Bridge CPCI Board

Desktop/Rackmount

FibreBridge 1180

FCBR-1180-DLC Fibre Channel to LVD Ultra2 SCSI Bridge with Copper DB9

FibreBridge 3300

FCBR-3300-DL0 2-Gigaabit Fibre Channel to LVD Ultra SCSI Bridge Desktop or Rackmount

FibreBridge 4500

FCBR-4500-DH0 Fibre Channel to HVD Ultra SCSI Bridge Desktop or Rackmount

FCBR-4500-DL0 Fibre Channel to LVD Ultra2 SCSI Bridge Desktop or Rackmount

ATTO FC Rack System (build to order)

FC Rack Enclosures with Power Supplies

FCRS-BAS1-000 Rack System with Single Power Supply

FCRS-BAS2-000 Rack System with Redundant Power Supplies

FibreBridge 3300

FCBR-3300-RL0 2-Gigabit Fibre Channel to LVD Ultra SCSI Bridge

Field Replacement Units (FRU)

PWRA-0000-FRU Power Module for ATTO FC Rack System

FCBR-3300-RLF ATTO FibreBridge 3300R LVD Replacement Unit

MIAs

ADAP-MIAS-BLK MIA Adapter-Short Wave

GBICS

GBIC-DB90-000	GBIC – DB9 Active Copper Interface
GBIC-HSDC-000	GBIC – HSSDC Active Copper Interface
GBIC-SWFO-000	GBIC – Short Wave Optical Duplex SC Interface
SFP2-0000-000	SFP – Optical LC

Cables/Copper

CBL-FCCU-003	DB9 Copper Fibre Channel Cable (Unequalized) – 3m.
CBL-FCCU-010	DB9 Copper Fibre Channel Cable (Unequalized) – 10m.
CBL-FCCE-020	DB9 Copper Fibre Channel Cable (Equalized) – 20m.
CBL-HSDB-003	HSSDC to DB9 Copper Fibre Channel Cable (Unequalized) – 3m.
CBL-HSDB-010	HSSDC to DB9 Copper Fibre Channel Cable (Unequalized) – 10m.
CBL-HSHS-003	HSSDC to HSSDC Copper Fibre Channel Cable (Unequalized) – 3m.
CBL-HSHS-010	HSSDC to HSSDC Copper Fibre Channel Cable (Unequalized) – 10m.

Cables/Optical

CBL-FCFI-005	5 Meter Cable-Duplex 50 Micron Multi-mode FC/Optical
CBL-FCFI-010	10 Meter Cable-Duplex 50 Micron Multi-mode FC/Optical
CBL-FCFI-030	30 Meter Cable- Duplex 50 Micron Multi-mode FC/Optical

Cables/FibreChain

CBL-FCFC-001	FibreChain 24” Cable Cables/SCSI

Cables/SCSI

CBL-FP68-C3	68-pin “P” / 50-pin Centronics – 1m
CBL-FP68-C6	68-pin “P” / 50-pin Centronics – 2m
CBL-FP68-C25	68-pin “P” / 50-pin Centronics – 8m
CBL-FP68-C79	68-pin “P” / 50-pin Centronics – 24m
CBL-F68E-00X	68-pin “P” / 68-pin fine pitch “P” – 1ft
CBL-U68E-681	68-pin “P” / 68-pin fine pitch “P” – 1m
CBL-F68E-686	68-pin “P” / 68-pin fine pitch “P” – 2m
CBL-F68E-003	68-pin “P” / 68-pin fine pitch “P” – 3m
CBL-F68E-010	68-pin “P” / 68-pin fine pitch “P” – 10m
CBL-F68E-025	68-pin “P” / 68-pin fine pitch “P” – 25m
CBL-F68E-68X	68-pin “P” / 68-pin fine pitch “P” – 16m.
CBL-V68E-48	68-pin offset VHDCI to 68-pin VHDCI

Appendix E Contact ATTO Technology, Inc.

Customer service, sales information and technical support are available by phone Monday through Friday, Eastern Standard Time 8:00 a.m. to 8:00 p.m., or by fax and web site 24-hours a day.

ATTO Technology, Inc.
155 CrossPoint Parkway
Amherst, New York 14068
(716) 691-1999 • voice
(716) 691-9353 • fax
http://www.attotech.com

ATTO Technology can also be reached via e-mail at the following addresses:

Sales Support: sls@attotech.com
Technical Support: techsupp@attotech.com